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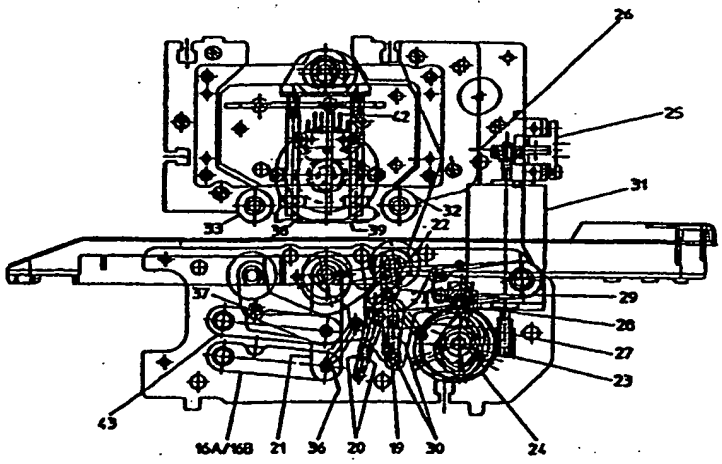
(54) Title: FRANKING MACHINE

(54) Bezeichnung: FRANKIERMASCHINE



(57) Abstract: The invention relates to a franking machine, comprising at least one print head of an ink-jet printing mechanism for printing flat postal items such as letters or postcards, which can be introduced into said mechanism or which pass through the same. Said franking machine consists of a guiding part (39) which is located around the print head and projects in relation to the nozzle opening plane of said print head and with which a conveying device is associated, said conveying device transporting the postal items between itself and conveying rollers lying opposite and rotating about axes that are located crosswise to the conveying direction. Said conveying device has two drive-connected driving rollers (32, 33) which together with the guiding part (39), form a path of travel. The driving rollers are located in front of and behind the print head in relation to the conveying direction. A reversibly liftable counter-pressure roller (13, 15) located opposite exerts a pressure on each driving roller (32, 33), respectively, or on a postal item being transported in-between.

(57) Zusammenfassung: Eine Frankiermaschine mit wenigstens einem Druckkopf eines Inkjet- oder Tintenstrahl-Druckwerkes zum Bedrucken von einlegbaren oder durchlaufenden flachen Versandobjekten wie Briefe oder Postkarten, bestehend aus einem um den Druckkopf und gegenüber dessen Düsenmündungsebene vorstehend angeordneten Führungsteil (39), dem eine die Versandobjekte zwischen sich und gegenüberliegenden, um quer

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Franking Machine

The invention relates to a franking machine with at least one print head of an inkjet printing mechanism for printing flat postal objects, such as letters or postcards, inserted into or passing through the machine, comprised of a guide part arranged so as to project from the print head and relative to its jet opening plane and having correlated therewith a transport device for transporting the postal objects between it and oppositely positioned conveying rollers rotating about axes oriented transverse to the conveying direction. The franking machines employ today in addition to the classical rotary printing technology increasingly new stamp application methods, inter alia, based on thermal or inkjet basis.

It has been shown in practice that not only the print head must be replaced, but depending on the printing technology the entire franking machine configuration is subject to greater and very complex, i.e., also correspondingly expensive, changes and modifications.

Inkjet print heads have been known for quite some time and are used, in particular, in PC printers. The knowledge that has been gained for use of such print heads in this field cannot be transferred onto the present field of use in franking machines. The reasons, inter alia, lie in the high speed of the letters undergoing franking as well as their different formats and thicknesses as well as the considerably rougher conditions of the

surroundings, caused partially by soiled surfaces of the postal objects. Moreover, these franking prints must fulfill strict quality requirements of the postal offices, which make necessary high construction expenditure and reliability.

The object of the present invention resides in that the franking machine is to be configured such that it enables, provided with an inkjet print head, as much as possible a disruption-free printing for the franking of postal objects, such as letters, cards or the like of different thickness, different formats and materials, and produces an unequivocally identifiable print image. Since presently such machines must enable high throughput, a fully automated operation is also required.

Special importance therefore resides in the guiding of the postal objects in the area of the print head. Since from the thinnest objects (essentially a single sheets) to a thick letter, a wide range of postal objects with most different mechanical properties - for example, bending behavior - as well as most different formats are to be printed or provided with franking, during the entire printing phase the spacing of the jet opening plane of the inkjet print head relative to the object surface to be printed must be constant. Moreover, conditions are to be provided which ensure a robust configuration, reliability, and low-maintenance configuration.

In addition to these requirements a robust embodiment, reliability, low-maintenance configuration, and high-quality of the print image are to be fulfilled.

According to the invention this object is solved in that the transport device comprises two drive rollers connected in driving connection with one another and forming together with the guide part a conveying path, which drive roller, when viewed in the conveying direction, are arranged before and behind the print head and in that a counterpressure roller is arranged opposite thereto, respectively, which exerts a pressure against the drive roller or the postal object to be transported therebetween and which is reversibly liftable. With these measures, high precision during printing of the postal objects and a high-quality economical manufacture as well as a simple operation can be obtained with the franking machine according to the invention.

In the following, the functions and the configuration as well as advantages of an embodiment of the franking machine according to the invention with inkjet printing technology will be described. The description is limited primarily in this context to the technical features for printing the postal object during the transport in the franking machine.

For a better understanding, reference is being had to the reference numerals and Figures in which embodiments of the invention are illustrated.

1A forward control curve for right counterpressure roller
1B rear control curve for right counterpressure roller
2A forward control curve for left counterpressure roller
2B rear control curve for left counterpressure roller
3 main shaft
4 rear sidewall

5 forward sidewall
6A counterpressure lever, left, front
6B counterpressure lever, left, rear
7A control lever, left, front
7B control lever, left, rear
8A counterpressure lever, right, front
8B counterpressure lever, right, rear
9A control lever, right, front
9B control lever, right, rear
10 axle for counterpressure lever and control lever
11 stop bolt for counterpressure lever - right
12 stop bolt for counterpressure lever - left
13 counterpressure roller - right
14 support roller
15 counterpressure roller - left
16A linkage, front, for support roller
16B linkage, rear, for support roller
17 axle for linkage
18 rod for suspending spring
19 suspension location for spring
20 tension spring for control lever
21 support roller carrier with sensor member
22 cam follower
23 worm shaft
24 worm gear
25 forked light barrier
26 slotted disk
27 switching cam for initial position of main shaft
28 microswitch
29 control roller

30 tension spring for counterpressure lever
31 direct-current motor
32 drive roller, right
33 drive roller, left
34 axle for counterpressure roller, right
35 stop for cam follower
36 tension spring for cam follower
37 stop for sensor member
38 sensor wheel for incremental transponder
39 holding-down plate or guide part
40 drive motor for feed
41 gearbox for drive rollers
42 incremental transponder, encoder
43 projecting member on support roller carrier

Description of the Drawing Contents of the Following Figures:

Fig. 1 front view of the complete counterpressure mechanism, including drive, sensor wheel, and main shaft drive;

Fig. 2 plan view onto counterpressure mechanism according to Fig. 1;

Fig. 3 front view of the complete counterpressure mechanism in franking position, counterpressure arrangement in upper position;

Fig. 4 front view of the complete counterpressure mechanism in service position, counterpressure arrangement in lowermost position;

Fig. 5 front view, position of counterpressure lever/rollers with inserted thick short letter or letter being fed from the right by automatic feeding into a position under the right drive roller;

Fig. 6 front view, thick letter underneath all drive rollers and the sensor wheel;

Fig. 7 front view, thick letter has left the right roller, the right counterpressure roller automatically reaches the upper position, the central support roller remains at the initial height level. The left counterpressure roller has taken over the height sensing; and

Fig. 8 plan view, drive rollers with feed gear mechanism.

In the case of franking of individual letters, the letter is inserted manually into the franking machine which is in its initial position. Phaoto cells start the franking process when the envelope is correctly positioned. The counterpressure rollers which are in a lower position upon insertion of the envelope are moved upwardly by the control curves on the main shaft and press the letter object against the upper drive rollers. The letter transport or the franking process can now be started.

The counterpressure arrangement is comprised of three counterpressure rollers. Two rollers are positioned under the right and left drive rollers. The third, central roller has the object to move the letter to the required height level under the print heads without pressing the letter against the end faces of the print heads so that the print image remains clean without smearing. After the franking process, the counterpressure rollers move again downwardly and release the gap for the insertion of a new envelope.

In addition to the insertion and franking position of the counterpressure rollers, there is also a position "service". In this position the counterpressure rollers are moved farther downwardly in order to provide room for the service station. The service station cleans and closes the print heads for longer work interruptions or during transport of the franking machine. Moreover, it is required for filling the print heads when changing the ink bag.

Construction and Function Descriptions of the Transport Device
On the main shaft 3 several control curves 1A, 1B and 2A, 2B are arranged which lift or lower, depending on the required position, the control levers 7A, 7B and 9A, 9B via the control rollers 29 so as to be pivoted about the axle 10. The initial position of the main shaft 3 is found by the microswitch 28 switched by the control cam 27. By means of the motor 31 the worm gear mechanism 23/24 is driven and the main shaft is rotated into the position "insertion of letter", "franking", or "service position". The precise position is reached by a forked light barrier 25 and the slotted disc 26 seated on the motor shaft by means of electronic control - as a result of the number of triggered pulses. The counterpressure levers to the right and left 6A, 6B and 8A, 8B are pivoted by the tension springs 30 connected to the control levers 7A, 7B and 9A, 9B in the upward direction about the axle 10 until the counterpressure rollers 13, 15 come to rest against the upper drive rollers 32, 33. The control levers 7A, 7B and 9A, 9B reach their end positions via the control curves 1A, 1B and 2A, 2B which has the result that the tension springs 36 are further pretensioned by a small amount. The safe contact between the control rollers 29 and the control curves 1A, 1B and 2A, 2B

is achieved by the tension springs 29 connected to the spring suspension rod 18. The precise lower position of the counterpressure levers 6A, 6B and 8A, 8B is reached at the stop bolts 11, 12 on the control levers which are supported on the counterpressure levers after a short return stroke and entrain them in the downward direction. The corresponding positions are illustrated in detail in the Figures.

The support roller 14 positioned at the center which moves the letter to an exact spacing relative to the inkjet print heads is seated rotationally supported on two support roller carriers 21 which are, in turn, supported by means of two parallelogram linkages 16A, 16B. The cam follower 22 seated on the rotation axle of the support roller 14 is connected to the axle 34 of the right counterpressure rollers 13 and is forced to move in the downward direction when lowering the right counterpressure lever 6A, 6B and reaches the level of the right counterpressure roller. The cam follower 22 is supported via the stop 35 against the support roller carrier 21 rigidly in regard to rotation to the left. With regard to rotation to the right, the cam follower 22 can rotate away from the stop 35 counter to the force of the tension spring 36. This is required because of the mutual sensing between the right and the left counterpressure roller and will be described in more detail later on.

Description to Figures 1 to 8:
The counterpressure levers 6A, 6B; 8A, 8B are in the initial position ready for insertion of an individual letter. As soon as the letter is positioned in an exact position to the rear and the right defined by the table stop, the franking machine is

activated by means of a reflective light barrier. First the main shaft 3 rotates about approximately one-third revolution in the clockwise direction. The control levers 7, 9 are pivoted upwardly by the control rollers 29 by means of the control curves 1, 2. The counterpressure levers are also moved upwardly via the tension springs 30 until the counterpressure rollers 13, 15 rest against the drive rollers 32, 33. The control levers move still farther until the control curve has reached its highest point. The possible overstroke of the control lever is compensated by the sprung coupling of the counterpressure levers. The support roller 14 has been adjusted by means of the cam follower 22 to the same level. The letter is now clamped between the drive rollers and the counterpressure rollers. The drive motor 40 (see Fig. 8) drives via the gear mechanism 41 the drive rollers 31, 33 and moves the letter from the right to the left. The speed and position detection is realized by the incremental transponder 42 and the sensing wheel 38. The sensing wheel is driven by friction by means of the moving letter envelope and detects thus the precise speed of the letter surface. The pressing of the letter against the sensing wheel is realized by a separate counterpressure arrangement which will be described separately in the following. As a function of the letter position, the inkjet print heads spray corresponding line patterns which result in the desired print image. The holding-down plate or the guide part 39 secures the letter at an exact spacing to the print head end face in order to enable with respect to resolution a clean print image and, furthermore, to prevent that the printed lines smear when moving the envelope. After completion of the franking process the drive motor is switched off and the main shaft returns by rotation into its initial position; the counterpressure levers

reach again their initial position. A new letter can be inserted. The main shaft 3 rotates between the position "insertion" and "franking" only by approximately one-third revolution back and forth, which provides a considerable time advantage and moreover is gentle on the mechanism. After a further one-third revolution the counterpressure rollers have reached their absolute lowest position as is required in the service position (see Fig. 4). Movement back into the initial position "insertion" requires also only one-third revolution.

In Fig. 5 the function of the cam follower 22 in connection with the right counterpressure roller 13 is illustrated. The necessity of this function is described in the following. The initial position is characterized by a relatively thick short envelope which is inserted manually. The franking machine triggers the franking process. The counterpressure levers move, as described, in the upward direction. The thickness of the short letter limits the stroke of the right counterpressure roller in the upward direction. The letter is clamped by means of the spring force that is built up by the tension spring 19 between the upper right drive roller 32 and the counterpressure roller 13. This is necessary in order to ensure a slip-free drive. If the support roller 14 were not moved automatically by means of the cam follower 22 to the same height level, the thick envelope could not be clamped between the upper stationary holding down plate or the guide part 39 and the support roller; this would result in transport problems and printing quality loss. By means of the already described cam follower 22 the support roller carrier with support roller is moved to the height level of the right counterpressure roller. The support roller

carrier moves synchronously in the form of a parallelogram with the right counterpressure roller in the downward direction and the envelope can pass without friction through the printing station.

In Fig. 6 the illustration shows the thick letter having been moved also under the left drive roller. The left counterpressure lever had to move also in the downward direction counter to the spring force and has reached the same height level as the right counterpressure lever or the central support roller. The stop 37 of the left counterpressure roller has contacted the sensing member of the support roller carrier 21.

In Fig. 7, the letter has left the right drive roller and the right counter roller moves again upwardly until the counterpressure roller contacts the upper drive roller. The stop 37 of the left counterpressure roller rests against the member 43 of the support roller carrier 21 and secures it now at the original height level. The right cam follower 22 can fold out by rotating to the left and the connecting point can follow the right counterpressure roller until the counterpressure roller rests against the upper right drive roller. The height sensing of the support roller is realized alternatingly between the right and left counterpressure roller and ensures thus over the entire letter length an optimal friction-free passage relative to the print heads and a friction-optimized spacing relative to the holding-down plate or the guide part.

Claims

1. Franking machine with at least one print head of an inkjet print mechanism for printing flat postal objects such as letters or postcards insertable into or passing through the machine, comprised of a guide part (39) arranged so as to project about the print head and further relative to its jet opening plane, having correlated therewith a transport device for transporting the postal objects between it and oppositely positioned conveying rollers rotating about axes oriented transverse to the conveying direction, characterized in that the transport device has two drive rollers (32, 33) connected in driving connection with one another and forming together with the guide part (39) a conveying path, which, when viewed in the conveying direction, are arranged before and behind the print head and in that a counterpressure roller (13, 15) is arranged opposite thereto, respectively, which exerts a pressure against one drive roller (32, 33) or the postal object to be transported therebetween and which is reversibly liftable.

2. Machine according to claim 1, characterized in that between the counterpressure rollers (13, 15) a support roller (14) is arranged which is connected to at least one of the liftable counterpressure rollers (13, 15) and adjustable with respect to the spacing of the guide part (39).

3. Machine according to claim 2, characterized in that at least one of the counterpressure rollers (13, 15) and the support

roller (14) can be moved into an insertion position, a franking position, or a servicing position.

4. Machine according to one of the claims 2 or 3, characterized in that the counterpressure rollers (13, 15) are supported, respectively, on controlled counterpressure lever pairs (6A,6B; 8A,8B) which have a common pivot axle (10).

5. Machine according to claim 4, characterized in that the support roller (14) is connected by a cam follower pair (22) with at least one of the counterpressure lever pairs (6A,6B; 8A,8B).

6. Machine according to claim 4, characterized in that the counterpressure lever pairs (6A,6B; 8A,8B) are connected by a driving connection with a control curve pair (1A,1B; 2A,2B), respectively, arranged on a motorically driven main shaft (3) and can be moved into a transport-active position.

7. Machine according to one of the claims 2 to 6, characterized in that the counterpressure rollers (13, 15) and the support roller (14) can be controlled so as to be lowered simultaneously.

8. Machine according to one of the claims 1 to 7, characterized in that the counterpressure lever pairs (6A,6B; 8A,8B) are connected by tension springs (36) with a counter control lever pair (7A,7B; (9A, 9B) supported on the control curve pairs (1A,1B; 2A,2B).

9. Machine according to claim 8, characterized in that the control lever pairs (7A,7B; 9A,9B) are supported on the pivot axle (10).

10. Machine according to claim 9, characterized in that the control lever pairs (7A, 7B; 9A,9B) are supported against spring force by means of control rollers (29) on the control curves (1A, 1B; 2A,2B).

11. Machine according to one of the claims 8 to 10, characterized in that the lower position of the counterpressure roller pairs (6A, 6B; 8A, 8B) is defined by a stop (11, 12) fastened on the control lever pairs (7A,7B; 9A,9B).

12. Machine according to one of the claims 5 to 11, characterized in that the support roller (14) is supported on a support roller carrier pair (21) connected to the control lever pair (7A, 7B).

13. Machine according to claim 12, characterized in that the support roller carrier pair (21) is connected at the end facing away from the support roller (14) with a parallelogram linkage pair (16A, 16B) and at the support roller end with the counterpressure roller (13) by means of the cam follower pair (22).

14. Machine according to claim 13, characterized in that the cam follower pair (22) is connected by tension springs with the free end of the parallelogram linkage pair (16A, 16B).

15. Machine according to claim 14, characterized in that the counterpressure lever pair (6A, 6B) is supported in the area of the counterpressure roller (15) on the parallelogram linkage pair (16A, 16B).

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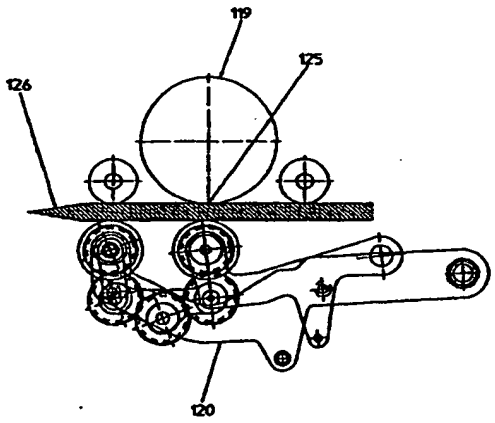

(57) Abstract: The invention relates to a franking machine, comprising a print head of an ink-jet printing mechanism for printing flat postal items such as letters or postcards, which can be introduced into said mechanism or which pass through the same. Said franking machine consists of a guiding part which is located around the print head and projects in relation to the nozzle opening plane of said print head, and with which a conveying device is associated, said conveying device transporting the postal items between itself and conveying rollers lying opposite and rotating about axes that are located crosswise to the conveying direction. Said conveying device has two drive-connected driving rollers which together with the guiding part, form a path of travel. The driving rollers are located in front of and behind the print head in relation to the conveying direction. A reversibly liftable counter-pressure roller located opposite exerts a pressure on each driving roller, respectively, or on a postal item being transported in-between. A roller feeler (39, 119) which is driven by the passing postal item and which is associated with an encoder device (122) is located between the driving rollers (13, 15; 127, 113) in order to monitor the speed and position of a postal item being transported or for controlling the pressure on a postal item.

(57) Zusammenfassung: Eine Frankiermaschine mit einem Druckkopf eines Inkjet- resp. Tintenstrahl-Druckwerkes zum Bedrucken von einlegbaren oder durchlaufenden flachen Versandobjekten wie Briefe oder Postkarten, besteht aus einem um den Druckkopf und gegenüber dessen Düsenmündungsebene vorstehend angeordneten Führungsteil, dem eine die Versandobjekte zwischen sich und gegenüberliegenden, um quer zur Förderrichtung

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Franking Machine

The invention relates to a franking machine with at least one print head of an inkjet printing mechanism for printing flat postal objects, such as letters or postcards, inserted into or passing through the machine, comprised of a guide part arranged so as to project from the print head and relative to its jet opening plane and having correlated therewith a transport device for transporting the postal objects between it and oppositely positioned conveying rollers rotating about axes oriented transverse to the conveying direction, wherein the transport device comprises two drive rollers connected in driving connection with one another and forming together with the guide part a conveying path, which drive rollers, when viewed in the conveying direction, are arranged before and behind the print head and has a counterpressure roller arranged opposite thereto, respectively, which exerts a pressure against the drive roller or the postal object to be transported therebetween and which is reversibly liftable. The franking machines employ today in addition to the classical rotary printing technology increasingly new stamp application methods, inter alia, based on thermal or inkjet basis.

It has been shown in practice that not only the print head must be replaced, but depending on the printing technology the entire franking machine configuration is subject to greater and very complex, i.e., also correspondingly expensive, changes and modifications.

Inkjet print heads have been known for quite some time and are used, in particular, in PC printers. The knowledge that has been gained for use of such print heads in this field cannot be transferred onto the present field of use in franking machines. The reasons, inter alia, lie in the high speed of the letters undergoing franking as well as their different formats and thicknesses as well as the considerably rougher conditions of the surroundings, caused partially by soiled surfaces of the postal objects. Moreover, these franking prints must fulfill strict quality requirements of the postal offices, which make necessary high construction expenditure and reliability.

The object of the present invention resides in that the franking machine is to be configured such that the printing mechanism enables a disruption-free printing for the franking of postal objects, such as letters, cards or the like of different thickness, different formats and materials, and an unequivocally identifiable print image. Since presently such machines must enable high throughput, a fully automated operation is also required.

Since from the thinnest objects (essentially a single sheet) to thick letters, a wide range of postal objects with most different mechanical properties - for example, bending behavior - as well as most different formats are to be printed or provided with franking, during the entire printing phase the printing must be adjusted or controlled with respect to the throughput speed or the travel distance covered by the postal object. In addition, conditions must be provided which ensure a great reliability and low-maintenance configuration.

According to the invention this object is solved in that a sensing wheel is arranged between the drive rollers which sensing wheel is driven by the postal object passing along it and is correlated with an encoding device for the purpose of speed and position monitoring of a transported postal object, respectively, for controlling printing on a postal object. In this way, with simple means a high precision during printing of the postal objects can be achieved.

In the following the functions and the configuration of an embodiment of the printing machine according to the invention is described. For a better understanding, reference is being had to the reference numerals and Figures in which embodiments of the invention are illustrated.

1A forward control curve for right counterpressure roller
1B rear control curve for right counterpressure roller
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7A control lever, left, front
7B control lever, left, rear
8A counterpressure lever, right, front
8B counterpressure lever, right, rear
9A control lever, right, front
9B control lever, right, rear

10 axle for counterpressure lever and control lever
11 stop bolt for counterpressure lever - right
12 stop bolt for counterpressure lever - left
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16A linkage, front, for support roller
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19 suspension location for spring
20 tension spring for control lever
21 support roller carrier with sensor member
22 cam follower
23 worm shaft
24 worm gear
25 forked light barrier
26 slotted disk
27 switching cam for initial position of main shaft
28 microswitch
29 control roller
30 tension spring for counterpressure lever
31 direct-current motor
32 drive roller, right
33 drive roller, left
34 axle for counterpressure roller, right
35 stop for cam follower
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38 sensor wheel for incremental transponder

39 holding-down plate or guide part

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41 gearbox for drive rollers

42 incremental transponder, encoder

43 projecting member on support roller carrier

Description of the Drawing Contents of the Following Figures

Fig. 1 front view of the complete counterpressure mechanism, including drive, sensor wheel, and main shaft drive;

Fig. 2 plan view onto counterpressure mechanism according to Fig. 1;

Fig. 3 front view of the complete counterpressure mechanism in franking position, counterpressure arrangement in upper position;

Fig. 4 front view of the complete counterpressure mechanism in service position, counterpressure arrangement in lowermost position;

Fig. 5 front view, position of counterpressure lever/rollers with inserted thicker short letter or letter being fed from the right by automatic feeding into a position under the right drive roller;

Fig. 6 front view, thick letter underneath all drive rollers and the sensor wheel;

Fig. 7 front view, thick letter has left the right roller, the right counterpressure roller automatically reaches the upper position, the central support roller remains at the initial height level. The left counterpressure roller has taken over the height sensing; and

Fig. 8 plan view, drive rollers with feed gear mechanism.

In the case of franking of individual letters, the letter is inserted manually into the franking machine. Photo cells start the franking process when the envelope is correctly positioned. The counterpressure rollers which are in a lower position upon insertion of the envelope are moved upwardly by the control curves on the main shaft and press the letter object against the upper drive rollers. The letter transport or the franking process is started.

The counterpressure arrangement is comprised of two counterpressure rollers and an intermediately positioned support roller. The counterpressure rollers are positioned under the right and left drive rollers. The support roller has the object to secure the letter at the required height level under the print heads without pressing the letter against the end faces of the print heads so that the print image remains clean without smearing. After the franking process, the counterpressure rollers and the support roller move again downwardly and release the gap for the insertion of a new envelope.

In addition to the insertion and franking positions of the counterpressure rollers and the support rollers, there is also a position "service". In this position the counterpressure rollers are moved even farther downwardly in order to provide room for the service station. The service station cleans and closes the print heads for longer work interruptions. Moreover, it is required for filling the print heads when changing the ink bag.

On the main shaft 3 several control curves 1A, 1B and 2A, 2B are arranged which lift or lower, depending on the required position,

the control levers 7A, 7B and 9A, 9B via the control rollers 29 so as to be pivoted about the axle 10. The initial position of the main shaft 3 is found by the microswitch 28 switched by the control cam 27. By means of the motor 31 the worm gear mechanism 23/24 is driven and the main shaft is rotated into the position "insertion of letter", "franking", or "service position". The precise position is reached by a forked light barrier 25 and the slotted disc 26 seated on the motor shaft by means of electronic control. The counterpressure levers to the right and left 6A, 6B and 8A, 8B are pivoted by the tension springs 30 connected to the control levers 7A, 6B and 9A, 9B in the upward direction about the axle 10 until the counterpressure rollers 13, 15 come to rest against the upper drive rollers 32, 33. The control levers 7A, 7B and 9A, 9B reach their end positions via the control curves 1A, 1B and 2A, 2B which has the result that the tension springs 36 are further pretensioned by a small amount. The safe contact between the control rollers 29 and the control curves 1A, 1B and 2A, 2B is achieved by the tension springs 29 connected to the spring suspension rod 18. The precise lower position of the counterpressure levers 6A, 6B and 8A, 8B is reached at the stop bolts 11, 12 on the control levers which are supported on the counterpressure levers after a short return stroke and entrain them in the downward direction. The corresponding positions are illustrated in detail in the Figures.

The support roller 14 positioned at the center, which moves the letter to an exact spacing relative to the inkjet print heads, is seated rotationally supported on two support roller carriers 21 which are, in turn, supported by means of two parallelogram linkages 16A, 16B. The cam follower 22 seated on the rotation

axle of the support roller 14 is connected to the axle 34 of the right counterpressure rollers 13 and is forced to move in the downward direction when lowering the right counterpressure lever 6A, 6B and reaches the level of the right counterpressure roller. The cam follower 22 is supported via the stop 35 against the support roller carrier 21 rigidly in regard to rotation to the left. With regard to rotation to the right, the cam follower 22 can rotate away from the stop 35 counter to the force of the tension spring 36. This is required because of the mutual sensing between the right and the left counterpressure rollers and will be described in more detail later on.

Description of Figures 1 to 8:
The counterpressure levers are in the initial position ready for insertion of an individual letter. As soon as the letter is positioned in an exact position to the rear and the right defined by the table stop, the franking machine is activated by means of a reflective light barrier. First the main shaft 3 rotates about approximately one-third revolution in the clockwise direction. The control levers 7, 9 are pivoted upwardly by the control rollers 29 by means of the control curves 1, 2. The counterpressure levers are also moved upwardly via the tension springs 30 until the counterpressure rollers 13, 15 rest against the drive rollers 32, 33. The control levers move still farther until the control curve has reached its highest point. The possible overstroke of the control lever is compensated by the sprung coupling of the counterpressure levers. The support roller 14 has been adjusted by means of the cam follower 22 to the same level. The letter is now clamped between the drive rollers and the counterpressure rollers. The drive motor 40 (see

Fig. 8) drives via the gear mechanism 41 the drive rollers 31, 33 and moves the letter from the right to the left. The speed and position detection is realized by the incremental transponder 42 and the sensing wheel 38. The sensing wheel is driven by friction by means of the moving envelope and detects thus the precise speed of the letter surface. The pressing of the letter against the sensing wheel is realized by a separate counterpressure arrangement which will be described separately in the following. As a function of the letter position, the inkjet print heads spray corresponding line patterns which result in the desired print image. The holding-down plate or the guide part 39 secures the letter at an exact spacing to the print head end face in order to enable with respect to resolution a clean print image and, furthermore, to prevent that the printed lines smear when moving the envelope. After completion of the franking process the drive motor 40 is switched off and the main shaft 3 returns by rotation into its initial position; the counterpressure levers 6A, 6B; 8A, 8B reach again their initial position. A new letter can be inserted. The main shaft 3 rotates between the position "insertion" and "franking" only by approximately one-third revolution back and forth, which provides a considerable time advantage and moreover is gentle on the mechanism. After a further one-third revolution the counterpressure rollers have reached their absolute lowest position as is required in the service position (see Fig. 4). Movement back into the initial position "insertion" requires also only one-third revolution.

In Fig. 5 the function of the cam follower in connection with the right counterpressure roller is illustrated. The necessity of this function is described in the following. The initial

position is characterized by a relatively thick short envelope which is inserted manually. The franking machine triggers the franking process. The counterpressure levers move, as described, in the upward direction. The thickness of the short letter limits the stroke of the right counterpressure roller in the upward direction. The letter is clamped by means of the spring force that is built up by the tension spring 19 between the upper right drive roller 32 and the counterpressure roller 13. This is necessary in order to ensure a slip-free drive. If the support roller 14 were not moved automatically by means of the cam follower 22 to the same height level, the thick envelope could not be clamped between the upper stationary holding-down plate or the guide part 39 and the support roller; this would result in transport problems and printing quality loss. By means of the already described cam follower 22 the support roller carrier with support roller is moved to the height level of the right counterpressure roller. The support roller carrier moves synchronously in the form of a parallelogram with the right counterpressure roller in the downward direction and the envelope can pass without friction through the printing station.

In Fig. 6 the illustration shows the thick letter having been moved also under the left drive roller. The left counterpressure lever had to move also in the downward direction counter to the spring force and has reached the same height level as the right counterpressure lever or the central support roller. The stop 37 of the left counterpressure roller has contacted the sensing member of the support roller carrier 21.

In Fig. 7, the letter has left the right drive roller and the right counter roller moves again upwardly until the counterpressure roller contacts the upper drive roller. The stop 37 of the left counterpressure roller rests against the projecting member 43 of the support roller carrier 21 and secures it now at the original height level. The right cam follower 22 can fold out by rotating to the left and the connecting point can follow the right counterpressure roller until the counterpressure roller rests against the upper right drive roller. The height sensing of the support roller is realized alternatingly between the right and left counterpressure roller and ensures thus over the entire letter length an optimal friction-free spacing relative to the print heads and the holding-down plate or the guide part 39.

101 counterpressure lever for driven incremental transponder
102 axis of rotation for counterpressure lever
103 stop bolt as follower stop for control lever 105
104 stop edge for stop bolt 103
105 control lever
106 connecting bracket for intermediate wheels
107 connecting bracket to the axle of the left counterpressure roller
108 driven friction wheel of incremental transponder sensing wheel
109 friction wheel for left counterpressure roller
110 intermediate wheel
111 intermediate wheel
112 intermediate wheel
113 drive roller - left

114 counterpressure roller - left
115 gear mechanism for feed drive
116 tensions spring between incremental transponder counterpressure lever and control lever
117 axle of left counterpressure roller
118 axle for intermediate wheel
119 sensing wheel for incremental transponder
120 counterpressure lever - left
121 encoder disc
122 encoder
123 axle for encoder disc
124 ball bearing
125 friction pair drive roller 113 and friction wheel 109
126 friction pair friction wheel 108 and sensing wheel 119
127 drive roller - right
128 counterpressure roller - right
129 support wheel
130 letter
131 axle for friction wheel

Contents of Drawings of the Following Figures:

Fig. 9 front view of the complete counterpressure mechanism, including drive, driven incremental transponder counterpressure arrangement, sensing wheel and main shaft drive. Counterpressure lever in the position "manual insertion";

Fig. 10 front view of the complete counterpressure mechanism, including drive, driven incremental transponder counterpressure arrangement, sensing wheel and main

shaft drive; counterpressure lever in the uppermost position "franking";

Figs. 11 + 12 counterpressure mechanism released;

Figs. 13 + 14 released driven counterpressure mechanism of the incremental transponder;

Fig. 15 front view, letter is underneath the right drive roller and has not yet reached the sensing wheel, sensing wheel is driven indirectly by means of left drive roller, friction wheels, and intermediate wheels;

Figs. 16 + 17 counterpressure mechanism released;

Fig. 18 front view, envelope underneath both drive rollers, sensing wheel driven directly by the letter surface;

Fig. 19 front view, envelope has left right drive roller, drive is realized now by means of the left drive roller, sensing wheel driven directly by the letter surface;

Fig. 20 plan view of the complete counterpressure mechanism;

Fig. 21 developed view of the driven incremental transponder counterpressure arrangement in section; and

Figs. 22 - 24 details of sensing wheel with encoder.

As a result of the short letter problems and the space requirements for the print heads in printing stations of a franking machine, in particular, an ink jet printing mechanism, drive rollers are required so that the envelope during the printing process is clamped always underneath one drive roller. The right drive roller drives the envelope when entering the printing area, the left roller carries on transportation downstream of the printing area. The speed and position monitoring of the envelope on one of the two rollers would have the disadvantage that the short letter within a certain travel

distance, i.e., at the beginning or the end of the envelope, would no longer be monitored. For the quality of the print image it is moreover required to know the exact letter speed. A speed detection on a driven shaft would have the disadvantage that not necessarily the letter speed is detected, when, for example, the letter has transport slip or is stopped or when a jam problem occurs. The speed or position monitoring is carried out in the device described here by means of a separate sensing wheel which drives directly an encoder disc. The encoder disc and the sensing wheel are arranged precisely between the drive rollers at the center of the two print heads. The signals are evaluated by means of an encoder. The exact starting position for manual insertion of the letter is provided by a reflection light barrier which determines the position of the right edge of the letter. For an automatic letter feed, this zero signal is supplied by a forked light barrier of a peripheral automatic feed. Beginning with this start signal, the sensing wheel must then sense the precise position of the letter. Since for manual insertion or automatic supply the letter has not reached the sensing wheel when the zero position is triggered and can therefore not provide driving action, this must be realized for a short travel distance by means of the driven sensing counterpressure. The pressure of the driven counterpressure roller on the sensing wheel or the left drive roller is realized by a curve-controlled mechanism of the remaining counterpressure levers or rollers. By means of two friction wheels and several intermediate wheels the speed of the left drive roller is transmitted onto the sensing wheel. The left and the right drive rollers are fixedly coupled by means of a spur gear system so that the speed of the letter driven by the right roller coincides with the speed of the left

driven roller. Small differences are inconsequential because printing has not yet begun. As soon as the letter, for example, a short letter, driven by the right drive roller, reaches a location underneath the sensing wheel, the speed of the driven counterpressure arrangement is inconsequential. The sensing wheel is driven by friction between the letter surface and sensing wheel periphery with identical speed. The counterpressure roller having acted previously as a friction wheel drive now only provides a pressing function because the envelope has been pushed between the friction partners. As a function of the length of the letter or the label length, the printing process begins at the letter position determined therefor. Corresponding to the respective envelope position the print heads spray a line pattern which results in the corresponding overall print image. After a certain travel distance the envelope leaves the right drive roller and is now moved only by the left drive roller. The sensing wheel senses the speed up to the end of the letter. Approximately 10 mm before the end of the envelope printing is complete.

The counterpressure lever 101 of the driven incremental transponder is rotationally supported on a rotary axle 102 riveted onto the sidewall. The up and down movement of the counterpressure lever is realized in connection with the remaining counterpressure levers. This function will be explained separately. The counterpressure lever 101 is moved upwardly and downwardly by means of the riveted stop bolt 103 and by means of the stop edge 104 of the control lever 105. The overstroke of the control lever is compensated up to the point of

contact of the friction wheel 108 at the sensing wheel 119 by means of the tension spring 116.

The friction wheel 108 is rotationally supported on the riveted rotary axle 131. By means of two connecting brackets 106, 107 the left counterpressure lever 120 and the counterpressure lever 101 are connected with one another so as to be rotatable and ensure that the connecting gear mechanism has a constant axle spacing while providing at the same time a rotational degree of freedom. The friction wheel 109 which is seated on the same axle 117 as the counterpressure roller 114 is driven by the left drive roller 113 (friction pair 125). Via the spur gears 112, 111, 110 the friction wheel 108 is driven with the same rotational speed (friction pair 126). Upon triggering the franking machine, the counterpressure levers are lifted upwardly to such an extent until the corresponding counterpressure rollers contact the drive rollers and the sensing wheel. At the beginning of the franking process, the short letter is driven only by the right drive roller 127 and pressed against by the right counterpressure roller 128. The drive of the sensing wheel is realized up to the point in time when the envelope reaches the area between friction wheel 108 and sensing wheel 119, through the gear chain from the left drive roller via friction and intermediate wheels to the sensing wheel. As soon as the letter is positioned under the sensing wheel 119 and is pressed against it by the friction wheel 108, only the speed of the letter surfaces is important for the circumferential speed of the sensing wheel. This means that the exact letter speed is detected. The sensing surface of the sensing wheel (mantle surface) can be made rough, knurled or the like for increasing grip.

When automatic feeding is performed, the driven counterpressure arrangement of the incremental transponder has also the advantage that the sensing wheel must not be accelerated by the letter which is supplied by the feed device. This feature is inconsequential in regard to manual supply because all rotating parts are accelerated simultaneously from their standstill position.

The sensing wheel 119 is seated together with the slotted encoder disc 121 on the axle 123 which is supported by means of two precision ball bearings. The encoder 122 senses the signals and transmits them to an electronic control device. The quality of the sensing action of the letter speed and of the position is of enormous importance for the print quality. The temporal sequence of spraying of the line print pattern is carried out as a function of the letter speed and thus of the letter position.

Claims

1. Franking machine with at least one print head of an inkjet print mechanism for printing flat postal objects such as letters or postcards insertable into or passing through the machine, comprised of a guide part arranged so as to project about the print head and further relative to its jet opening plane, having correlated therewith a transport device for transporting the postal objects between it and oppositely positioned conveying rollers rotating about axes oriented transverse to the conveying direction, wherein the transport device has two drive rollers connected in driving connection with one another and forming together with the guide part a conveying path, which drive rollers, when viewed in the conveying direction, are arranged before and behind the print head, and has a counterpressure roller arranged opposite thereto, respectively, which exerts a pressure against one drive roller or the postal object transported therebetween and which is reversibly liftable, characterized in that a sensing wheel (38, 119) is arranged between the drive rollers (32, 33; 127, 113) which sensing wheel is driven by the postal object passing along it and is correlated with an encoding device (122) for the purpose of speed and position monitoring of a postal object to be transported, respectively, for controlling printing on a postal object.

2. Machine according to claim 1, characterized in that the encoding device (122) is connected to a control unit connected to a computer.

3. Machine according to one of the claims 1 or 2, characterized in that the sensing wheel (38, 119) is in drive connection with the drive roller (33, 113) arranged downstream in the conveying direction.

4. Machine according to claim 3, characterized in that, laterally to the counterpressure roller (15, 114) cooperating with the drive roller (33, 113), a friction wheel (109) is provided which is concentric to and freely rotatingly supported relative to the counterpressure roller and can be brought into drive connection by the counterpressure levers (6A, 6B; 120) with the drive roller (33, 113), which friction wheel drives a further friction wheel (126) by means of an intermediate gear formed of intermediate wheels, the further friction wheel being in drive connection with the sensing wheel (38, 119).

5. Machine according to claim 4, characterized in that the further friction wheel (126) is supported with the counterpressure roller (115, 114) on a multi-part lever (101) and is movable against the sensing wheel (38,119) counter to a spring force.

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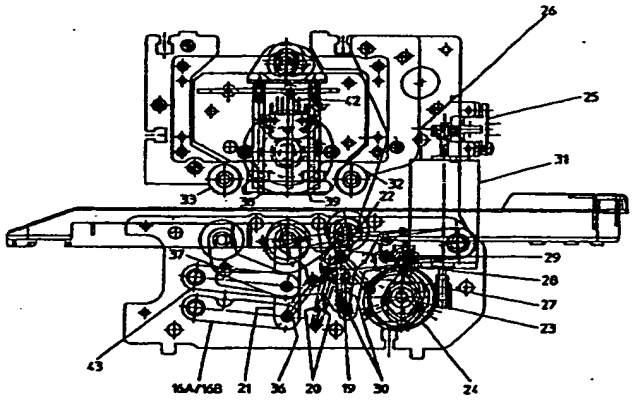
(54) Title: FRANKING MACHINE

(54) Bezeichnung: FRANKIERMASCHINE



(57) Abstract: The invention relates to a franking machine that comprises at least one print head of an inkjet printer for printing flat mail items such as letters or postcards that are inserted into or run through said franking machine. The inventive franking machine comprises a guide part that is mounted around the print head so as to project vis-à-vis the nozzle plane thereof. Said guide part is associated with a conveyor that conveys the mail items between itself and opposite rotating convey rollers that rotate about pins mounted transversally to the direction of conveyance. Said conveyor is provided with driving rollers that are mounted, when seen in the direction of conveyance, before and behind the print head (228). A counter-pressure roller is disposed opposite these driving rollers and exerts a pressure on a respective driving roller or on a mail item conveyed therethrough, said counter-pressure roller being reversibly liftable. The franking machine further comprises a device for servicing, cleaning and maintaining the print head. When the counter-pressure rollers (13, 15) are lowered, a service carriage (201) that is driven to be displaced transversally to the direction of conveyance of the mail items can be displaced into a service position below the print head (228).

(57) Zusammenfassung: Eine Frankiermaschine mit wenigstens einem Druckkopf eines Inkjet-Druckwerkes zum Bedrucken von einlegbaren oder durchlaufenden flachen Versandobjekten wie Briefe oder Postkarten, besteht aus einem um den Druckkopf und gegenüber dessen Düsenebene vorstehend angeordneten Führungsteil, dem eine die Versandobjekte zwischen sich und gegenüberliegenden, um quer zur Förderrichtung angeordnete Achsen rotierende Förderrollen einer die Versandobjekte transportierenden Fördereinrichtung

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WO 01/62505 A1

Translation of WO 01/62505 A1 (PCT/CH01/00117)

Franking Machine

The invention relates to a franking machine with at least one print head of an inkjet printing mechanism for printing flat postal objects, such as letters or postcards, inserted into or passing through the machine, comprised of a guide part arranged so as to project from the print head and relative to its jet plane and having correlated therewith a transport device for transporting the postal objects between it and oppositely positioned conveying rollers rotating about axes oriented transverse to the conveying direction, wherein the transport device comprises two drive rollers connected in driving connection with one another and forming together with the guide part a conveying path, which drive rollers, when viewed in the conveying direction, are supported before and behind the print head, and comprises a counterpressure roller arranged opposite thereto, respectively, which exerts a pressure against the drive roller or the postal object to be transported therebetween and which is reversibly liftable, and comprising a device for maintaining, cleaning and caring for the print head. The franking machines employ today in addition to the classical rotary printing technology increasingly new stamp application methods, inter alia, based on thermal or inkjet basis.

It has been shown in practice that not only the print head must be replaced, but depending on the printing technology the entire franking machine configuration is subject to greater and very

complex, i.e., also correspondingly expensive, changes and modifications.

Inkjet print heads have been known for quite some time and are used, in particular, in PC printers. The knowledge that has been gained for use of such print heads in this field cannot be transferred onto the present field of use in franking machines. The reasons, inter alia, lie in the high speed of the letters undergoing franking as well as their different formats and thicknesses as well as the considerably rougher conditions of the surroundings, caused partially by soiled surfaces of the postal objects. Moreover, these franking prints must fulfill strict quality requirements of the postal offices, which make necessary high construction expenditure and reliability.

The object of the present invention resides in providing a franking machine with an inkjet print mechanism that enables a disruption-free printing for the franking of postal objects, such as letters, cards or the like, and an unequivocally identifiable print image. It is also important that the employed printing ink during standstill phases will not dry up in the print head, i.e., the printing machine should be usable anytime. Moreover, in the configuration of the franking machine it should be taken into account that leaking of the printing ink cannot occur during transport. It is also desirable to be able to clean a print head which is soiled by dust and printing ink. Moreover, conditions are to be provided that ensure a high reliability and low-maintenance configuration.

According to the invention this object is solved in that, when the counterpressure rollers are lowered, a service slide, arranged on a guide arrangement so as to be drivingly movable transverse to the conveying direction of the postal objects, can be moved into a service position which is arranged underneath the print head.

In the following the functions and the configuration of an embodiment of the printing machine according to the invention is described. For a better understanding, reference is being had to the reference numerals and Figures in which embodiments of the invention are illustrated.

1A forward control curve for right counterpressure roller
1B rear control curve for right counterpressure roller
2A forward control curve for left counterpressure roller
2B rear control curve for left counterpressure roller
3 main shaft
4 rear sidewall
5 forward sidewall
6A counterpressure lever, left, front
6B counterpressure lever, left, rear
7A control lever, left, front
7B control lever, left, rear
8A counterpressure lever, right, front
8B counterpressure lever, right, rear
9A control lever, right, front
9B control lever, right, rear
10 axle for counterpressure lever and control lever
11 stop bolt for counterpressure lever - right

12 stop bolt for counterpressure lever - left
13 counterpressure roller - right
14 support roller
15 counterpressure roller - left
16A linkage, front, for support roller
16B linkage, rear, for support roller
17 axle for linkage
18 rod for suspending spring
19 suspension location for spring
20 tension spring for control lever
21 support roller carrier with sensor member
22 cam follower
23 worm shaft
24 worm gear
25 forked light barrier
26 slotted disk
27 switching cam for initial position of main shaft
28 microswitch
29 control roller
30 tension spring for counterpressure lever
31 direct-current motor
32 drive roller, right
33 drive roller, left
34 axle for counterpressure roller, right
35 stop for cam follower
36 tension spring for cam follower
37 stop for sensor member
38 sensor wheel for incremental transponder
39 holding-down plate or guide part
40 drive motor for feed

41 gearbox for drive rollers

42 incremental transponder, encoder

43 projecting member on support roller carrier

Description of the Drawing Contents of the Following Figures:

Fig. 1 front view of the complete counterpressure mechanism, including drive, sensor wheel, and main shaft drive;

Fig. 2 plan view onto counterpressure mechanism;

Fig. 3 front view of the complete counterpressure mechanism in franking position, counterpressure arrangement in upper position;

Fig. 4 front view of the complete counterpressure mechanism in service position, counterpressure arrangement in lowermost position.

In the case of franking of individual letters, the letter is inserted manually into the franking machine. Photo cells start the franking process when the envelope is correctly positioned. The counterpressure rollers which are in a lower position upon insertion of the envelope are moved upwardly by the control curves on the main shaft and press the letter object against the upper drive rollers. The letter transport or the franking process is started.

The counterpressure arrangement is comprised of three counterpressure rollers. Two rollers are positioned under the right and left drive rollers. The third, central roller has the object to move the letter to the required height level under the print heads without pressing the letter against the end faces of the print heads so that the print image remains clean without

smearing. After the franking process, the counterpressure rollers move again downwardly and release the gap for the insertion of a new envelope.

In addition to the insertion and franking positions of the counterpressure rollers, there is also a position "service". In this position the counterpressure rollers are moved farther downwardly in order to provide room for the service station. The service station cleans and closes the print heads for longer work interruptions. Moreover, it is required for filling the print heads when changing the ink bag.

On the main shaft 3 several control curves 1A, 1B and 2A, 2B are arranged which lift or lower, depending on the required position, the control levers 7A, 7B and 9A, 9B via the control rollers 29 so as to be pivoted about the axle 10. The initial position of the main shaft 3 is found by the microswitch 28 switched by the control cam 27. By means of the motor 31 the worm gear mechanism 23/24 is driven and the main shaft is rotated into the position "insertion of letter", "franking", or "service position". The precise position is reached by a forked light barrier 25 and the slotted disc 26 seated on the motor shaft by means of electronic control. The counterpressure levers to the right and left 6A, 6B and 8A, 8B are pivoted by the tension springs 30 connected to the control levers 7A, 6B and 9A, 9B in the upward direction about the axle 10 until the counterpressure rollers 13, 15 come to rest against the upper drive rollers 32, 33. The control levers 7A, 7B and 9A, 9B reach their end positions via the control curves 1A, 1B and 2A, 2B which has the result that the tension springs 36 are further pretensioned by a small amount. The safe contact

between the control rollers 29 and the control curves 1A, 1B and 2A, 2B is achieved by the tension springs 29 connected to the spring suspension rod 18. The precise lower position of the counterpressure levers 6A, 6B and 8A, 8B is reached at the stop bolts 11, 12 on the control levers which are supported on the counterpressure levers after a short return stroke and entrain them in the downward direction. The corresponding positions are illustrated in detail in the Figures.

The support roller 14 positioned at the center, which moves the letter to an exact spacing relative to the inkjet print heads, is seated rotationally supported on two support roller carriers 21 which are, in turn, supported by means of two parallelogram linkages 16A, 16B. The cam follower 22 seated on the rotation axle of the support roller 14 is connected to the axle 34 of the right counterpressure rollers 13 and is forced to move in the downward direction when lowering the right counterpressure lever 6A, 6B and reaches the level of the right counterpressure roller. The cam follower 22 is supported via the stop 35 against the support roller carrier 21 rigidly in regard to rotation to the left. With regard to rotation to the right, the cam follower 22 can rotate away from the stop 35 counter to the force of the tension spring 36. This is required because of the mutual sensing between the right and the left counterpressure rollers and will be described in more detail later on.

Description of Figures 1 to 4:
The counterpressure levers are in the initial position ready for insertion of an individual letter. As soon as the letter is positioned in an exact position to the rear and the right defined

by the table stop, the franking machine is activated by means of a reflective light barrier. First the main shaft 3 rotates about approximately one-third revolution in the clockwise direction. The control levers 7, 9 are pivoted upwardly by the control rollers 29 by means of the control curves 1, 2. The counterpressure levers are also moved upwardly via the tension springs 30 until the counterpressure rollers 13, 15 rest against the drive rollers 32, 33. The control levers move still farther until the control curve has reached its highest point. The possible overstroke of the control lever is compensated by the sprung coupling of the counterpressure levers. The support roller 14 has been adjusted by means of the cam follower 22 to the same level. The letter is now clamped between the drive rollers and the counterpressure rollers. The drive motor 40 (see Fig. 8) drives via the gear mechanism 41 the drive rollers 31, 33 and moves the letter from the right to the left. The speed and position detection is realized by the incremental transponder 42 and the sensing wheel 38. The sensing wheel is driven by friction by means of the moving envelope and detects thus the precise speed of the letter surface. As a function of the letter position, the inkjet print heads spray corresponding line patterns which result in the desired print image. The holding-down plate or the guide part 39 secures the letter at an exact spacing to the print head end face in order to enable with respect to resolution a clean print image and, furthermore, to prevent that the printed lines smear when moving the envelope. After completion of the franking process the drive motor is switched off and the main shaft returns by rotation into its initial position; the counterpressure levers reach again their initial position. A new letter can be inserted. The main shaft

3 rotates between the position "insertion" and "franking" only by approximately one-third revolution back and forth, which provides a considerable time advantage and moreover is gentle on the mechanism. After a further one-third revolution the counterpressure rollers have reached their absolute lowest position as is required in the service position (see Fig. 4). Movement back into the initial position "insertion" requires also only one-third revolution.

Parts Identification List

201 service slide
202 lifting tub
203 sealing bell
204 sealing bell receptacle
205 pressure spring for sealing bell
206 angle connector
207 suction hose of the sealing bells
208 wiper module
209 wiper lip
210 suction hose of wiper module
211 catch basin
212 guide bore for column
213 pressure spring for wiper tub
214A sensing curve - left
214B sensing curve - right
215 curved Scotch-yoke groove
216 lifting support
217 pressure spring for lifting tub
218 control disc
219 freewheeling sleeve

220 drive shaft for control disc
221 eccentric pin
222 control angle piece
223 control pin
224 microswitch for zero point positioning
225 guide and pulling column
226A lift control curve - front
226B lift control curve - rear
227 glide bushing
228 print head
229 holding-down plate
230 lifting column
231 head plate for lifting columns
232 eccentric
233 axis of rotation
234 pivot lever
235 freewheeling sleeve (hose pump)
236 pump housing
237 roller body
238 pump hose
239 hose connector
240 pump shaft
241 control curve for holding-down plate or guide part in the worm wheel of the main shaft drive
242 sensing pin
243 pivot point for control lever
244 control lever

Description of Contents of Drawings for the Following Figures:

Fig. 5 service slide in the rearward position, holding-down plate in the upper position;

Fig. 6 longitudinal section of print head plane and service slide

service slide is of the front position, holding-down plate or guide part in the upper position, wiper module at the holding-down plate or guide part maintained at height level, lifting tub of service slide still in the lower position;

Fig. 7 longitudinal section of print head plane and service slide

service slide is in the front position, holding-down plate or guide part in the upper position, wiper module at the holding-down plate or guide part maintained at height level, lifting tub of the service slide is lifted, pulling columns are pulled to the rear, sealing bells are resting against the end faces of the print heads;

Figs. 8 - 10 detail illustration service slide with lifting tub, sealing bells, and wiper module;

Figs. 11 + 12 detail illustration service and hose pump drives with drive motor;

Fig. 13 front view of control mechanism of holding-down plate or guide part by means of a control curve seated on the main shaft, holding-down plate or guide part in lower position (franking mode); and

Fig. 14 front view of the control mechanism of the holding-down plate or guide part by means of the control curve seated on the main shaft, holding-down plate or guide part in upper position (service mode).

The service station is provided for print head cleaning of an inkjet printing mechanism during operation and sealing of the inkjet print heads for extended periods of non-use or for taking in the ink from a newly inserted ink bag. The cleaning is carried out by means of a wiper wiping along the lower print head side. The sealing bells are positioned by means of the service slides under the end face of the print heads or jet plane and are then moved approximately vertically upwardly in order to seal the jets. A hose pump with three separate suction hoses pumps the residual ink of the wiping process out of the wiper module or the ink which has been sucked away or after-sucked via the print heads during filling of the system into a catch basin. The movement of the service slide is realized by a Scotch-yoke drive which is motor-driven by a worm gear. The same drive drives also the hose pump. Since the two functions are never needed simultaneously, they can be realized by a single drive motor by using freewheeling sleeves and different motor rotation directions. The holding-down plate or the guide part ensuring the spacing of the letter object to the end faces of the print heads is positioned in the franking mode approximately 1 mm below the print heads and must be moved in the service or cleaning mode upwardly, approximately 1.5 mm, behind the print head end face. This is realized in connection with lowering of the counterpressure lever, controlled by the main shaft.

The inkjet print heads 228 are attached to an adjusting module. By means of this mechanical device the print heads can be precisely adjusted relative to one another so that the initial pixel of one head coincides precisely with the final pixel of the second head and in this way no print image gaps result. The print

heads are connected by means of hoses to an ink container which can be easily exchanged. For the first operation, the ink must be removed by vacuum from the ink bag and the print heads must be flooded. For this purpose, the service slide 201 is driven by means of the control disc 216 into the forward position. The eccentric pin 221 of the control disc 218 engages the groove 215 of a Scotch-yoke of the service slide 201. As a result of the shape of the Scotch yoke groove, the service slide is moved forwardly only until the eccentric pin 221 reaches the curved area of the groove. The radius of the groove is of the same size as the eccentric stroke of the eccentric pin which means that the slide is now no longer moved and has reached its end position. The curvature of this groove is reached after an angle of rotation of approximately 150°. The sealing bells are now positioned precisely underneath the print heads. Upon forward movement of the service slide, the wiper lip 209 of the wiper module 208 has wiped the end faces of the print heads 228 and has cleaned them. The wiper module has been adjusted by means of the sensing curve 214A, 214B against the pressure springs 213 at the lower surface of the holding-down plate or the guide part 229 to the required height so that the defined coverage of the wiper blade relative to the printed end face results. While the control disc 218 rotates by a further 30°, the control angle piece 222 is moved with the guide and pulling columns 225 corresponding to the geometry of the lower control curve of the control disc 218 in the downward direction. The lift control curves 226A, 226B inserted into the columns 225 are moved also and lift thereby the lifting tub with the sealing bells against the force of the pressure springs 217 via the lifting supports 216 by a further defined lifting stroke. The two sealing bells

203 seated in the lifting tub and the sealing bell receptacle 204 also move upwardly until the sealing bell profile rests against the end faces of the print heads. The overstroke of the lifting tub 202 is compensated by the pressure springs 205. The print heads are now sealed. The motor of the service drive changes its direction of rotation and activates the operation of the hose pump. The control disc 218 no longer rotates as a result of the provided freewheeling sleeve. The freewheeling sleeves 235 now act in the entraining direction. In the case of a service slide movement they act as a freewheeling device. While the hose pump 236 rotates, the wiped-off ink is removed from the wiper module 208 or the catch basin 211 by suction and at the same time ink is removed by suction via the print heads 228 out of the ink bag and the print heads are flooded. During the service process the holding-down plate or guide part 229 must be in the upper position and its lower surface area must be retracted relative to the print head end faces. Lifting of the holding-down plate or guide part is realized by the control curve 242 and the joint function of the parts control lever 244, pivot lever 234, axis of rotation 233, and eccentric 232. The eccentric 232 lifts the head plate 231. By means of the lifting columns 230 the holding-down plate or the guide part is moved upwardly. After filling of the print heads the control disc is rotated by 30° and the lifting tub is lowered into the initial position. The sealing bells are again released. By means of the hose pump the ink rest is removed by suction from the sealing bells. Subsequently, the service slide can be returned into its initial position. Upon returning, the print heads are again wiped. The zero point position is found by a switching cam on the control disc 218 and the microswitch 224. By means of the slotted disc seated on the

motor axle and a forked light barrier, any desired slide position can be precisely reached and any number of pump revolutions are possible.

Claims

1. Franking machine with at least one print head of an inkjet print mechanism for printing flat postal objects such as letters or postcards insertable into or passing through the machine, comprised of a guide part arranged so as to project about the print head and further relative to its jet opening plane, having correlated therewith a transport device for transporting the postal objects between it and oppositely positioned conveying rollers rotating about axes oriented transverse to the conveying direction, wherein the transport device has two drive rollers connected in driving connection with one another and forming together with the guide part a conveying path, which drive rollers, when viewed in the conveying direction, are arranged before and behind the print head, and has a counterpressure roller arranged opposite thereto, respectively, which exerts a pressure against one drive roller or the postal object transported therebetween and which is reversibly liftable, and comprising a device for maintaining, cleaning and servicing the print head, characterized in that, when the counterpressure rollers (13, 15) are lowered, a service slide (221), arranged on a guide arrangement (225) so as to be drivingly movable transverse to the conveying direction of the postal objects, is moveable into a service position which is arranged underneath the print head (228).

2. Machine according to claim 1, characterized in that the guide part (229) is adjustable by means of a control lever (244) connected with the main shaft into a position which is

retracted relative to the jet opening plane of the print head (228).

3. Machine according to claim 1 or 2, characterized in that the service slide (201) at its rear end is connected with an eccentric pin (221) fastened to a control disk (218) drivable about a vertical axis.

4. Machine according to one of the claims 1 to 3, characterized in that the service slide (201) at the forward end has a wiper lip (209) extending transversely to the direction of movement and acting during movement of the service slide (201) onto the projecting jet opening plane of the print head (228).

5. Machine according to claim 4, characterized in that the wiper lip (209) is supported against a spring force on the guide part (229) and passes across the jet opening plane during the sliding movements of the service slide (201).

6. Machine according to one of the claims 4 and 5, characterized in that the wiper lip (209) is arranged in a catch basin (211).

7. Machine according to one of the claims 4 to 6, characterized in that the service slide (201) in the advancing direction has at least one sealing bell (203) which is arranged behind the wiper lip (209) and covers the nozzle opening plane of a print head (228) and can be pressed against the plane by being lifted.

8. Machine according to claim 7, characterized in that the service slide (201) comprises a Scotch-yoke groove (215) as a connecting device to the control disk (218) for receiving the eccentric pin (221), wherein the groove secures the service slide (201) in the service position when the eccentric pin (221) passes through and, upon further rotational movement of the control disk (218) connected in driving connection with the guide arrangement (225), the service slide (201) is locked in the service position by means of the lifting control curves (226A, 226B) provided on the guide arrangement (225), whereby the sealing bell (203) is pressed against the jet opening plane.

9. Machine according to claim 8, characterized in that on the guide arrangement (225) a control pin (223) is fastened which engages the control curve provided on the control disk (218).

10. Machine according to one of the claims 7 to 9, characterized in that the controllable motor which is in drive connection with the control disk (218) having a freewheeling device is reversibly configured and in drive connection with a pump which is in communication with the sealing bell (203).

11. Machine according to claim 10, characterized in that the pump is connected by a suction line with the catch basin (211) correlated with the wiper lip (209).

12. Machine according to one of the claims 7 to 11, characterized in that the pump is connected to the ink

source by a suction line via the sealing bell (203) connected in the service position to the print head/the print heads (228).

13. Machine according to claim 12, characterized in that the print head/the print heads (228) and the ink source are connected by a portion of the suction line.

14. Machine according to one of the claims 3 to 13, characterized in that the control disk (218) comprises a switching cam cooperating with a switch (224) and correlated with the initial position of the service slide (201).

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen
PCT/CH 01/00121

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 7 B41J13/12 G07B17/00

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 7 B41J G07B

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)
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C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
Y	US 5 166 883 A (GILHAM DENNIS T) 24. November 1992 (1992-11-24) Spalte 3, Zeile 17 -Spalte 5, Zeile 32; Abbildung 4	1-3
Y	US 5 913 627 A (LILLY NORMAN R ET AL) 22. Juni 1999 (1999-06-22) Spalte 3, Zeile 8 -Spalte 4, Zeile 42; Abbildungen 1,2	1-3
Y	US 4 821 049 A (ECKL JOHN K) 11. April 1989 (1989-04-11) Spalte 3, Zeile 19 -Spalte 5, Zeile 45; Abbildungen 1-3	1-3

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[X] Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

[X] Siehe Anhang Patentfamilie

* Besondere Kategorien von angegebenen Veröffentlichungen :
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11. Juni 2001	22/06/2001

Name und Postanschrift der Internationalen Recherchenbehörde	Bevollmächtigter Bediensteter
Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Widmeier, W

Formblatt PCT/ISA/210 (Blatt 2) (Juli 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/CH 01/00121

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(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

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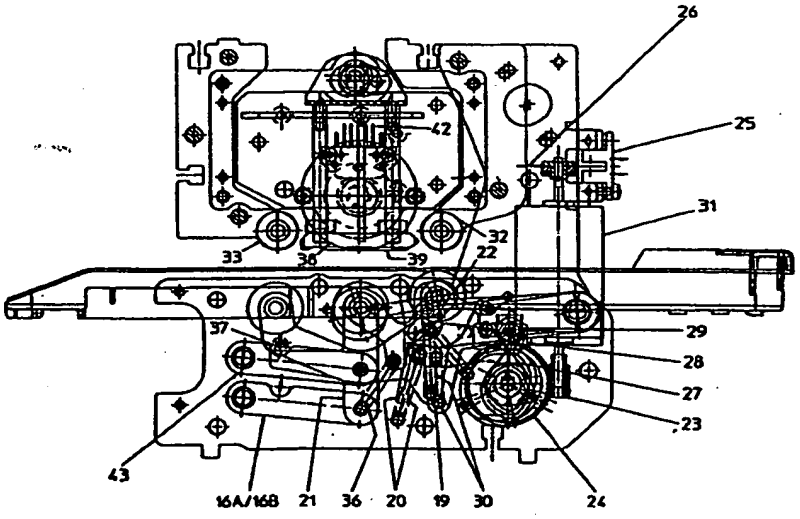
(54) Title: FRANKING MACHINE

(54) Bezeichnung: FRANKIERMASCHINE



(57) Abstract: The invention relates to a franking machine comprising an inkjet printing unit with two printing heads (301A, 301B), for printing on flat posted objects which can be inserted or run through the unit, such as letters or postcards. Said machine further comprises a guide piece (317), arranged around the print heads (301A, 301B) and projecting relative to the common jet opening plane thereof. A transport device for the posted objects is connected to said guide piece, with two drive rollers which, together with the guide piece, form a transport path and which are mounted before and after the print head, relative to the transport direction. The printing heads (301A, 301B) form a common jet opening plane and on the jet opening plane are rectangular in form, arranged at a steep angle to the direction of travel of the posted objects and mutually offset from each other.

(57) Zusammenfassung: Eine Frankiermaschine mit einem zwei Druckköpfe (301A, 301B) aufweisenden Inkjet-Druckwerk zum Bedrucken von einlegbaren oder durchlaufenden flachen Versandobjekten, wie Briefe oder Postkarten, besteht aus einem um die Druckköpfe (301A, 301B) und gegenüber deren gemeinsamer Düsenmündungsebene vorstehend angeordneten Führungsteil (317),

[Fortsetzung auf der nächsten Seite]

WO 01/62506 A1

Frankiermaschine

Die Erfindung betrifft eine Frankiermaschine mit einem wenigstens einen Druckköpfe aufweisenden Inkjet-Druckwerkes zum Bedrucken von einlegbaren oder durchlaufenden flachen Versandobjekten wie Briefe oder Postkarten, bestehend aus einem um den Druckkopf und gegenüber dessen Düsenmündungsebene vorstehend angeordneten Führungsteil, dem eine die Versandobjekte zwischen sich und gegenüberliegenden, um quer zur Förderrichtung angeordnete Achsen rotierende Förderrollen einer die Versandobjekte transportierenden Fördereinrichtung zugeordnet ist, wobei die Fördereinrichtung zwei mit dem Führungsteil eine Förderstrecke bildende Antriebsrollen aufweist, die in Förderrichtung betrachtet vor und hinter den Druckköpfen gelagert sind, und gegenüberliegend, gegen die Antriebsrollen resp. ein dazwischen transportiertes Versandobjekt einen Druck ausübende Gegendruckrollen vorgesehen sind.

Bei Frankiermaschinen werden heute nebst der klassischen Rotationstechnik vermehrt neue Stempelaufbringverfahren, u.a. auf Thermo- und Inkjetbasis, eingesetzt.
Inkjet- oder Tintenstrahldruckköpfe sind seit längerem bekannt und werden insbesondere bei PC-Druckern eingesetzt. Die dort beim Einsatz solcher Druckköpfe

gewonnenen Erkenntnisse können nicht auf das hier vorliegende Einsatzgebiet in Frankiermaschinen übertragen werden. Die Gründe liegen u.a. in der hohen Geschwindigkeit der zu frankierenden Briefe, deren unterschiedlichsten Formate und Dicken sowie den bedeutend rauheren Umgebungsbedingungen, beruhend auf zumTeil verschmutzten Oberflächen der Versandobjekte. Zudem müssen die Frankieraufdrucke strenge Qualitätsanforderungen der Poststellen erfüllen, was hohen Konstruktionsaufwand und Zuverlässigkeit verlangt.

Der vorliegenden Erfindung liegt die Aufgabe zugrunde, eine Frankiermaschine mit einem Inkjet-Druckwerk zu schaffen, das beim Frankieren von Versandobjekten wie Briefe, Karten oder dgl. ein störungsfreies Bedrucken und ein eindeutig identifizierbares Druckbild erlaubt.
Daneben sind Voraussetzungen zu schaffen, die eine hohe Zuverlässigkeit und wartungsarme Konstruktion gewährleisten.

Erfindungsgemäss wird diese Aufgabe dadurch gelöst, dass das Druckwerk wenigstens zwei Druckköpfe aufweist, die eine gemeinsame Düsenmündungsebene bilden, dass die Druckköpfe auf die Düsenmündungsebene betrachtet jeweils rechteckig ausgebildet, in einem spitzen Winkel zur Förderrichtung der Versandobjekte und gegenseitig teilweise versetzt zueinander angeordnet sind.

Nachfolgend sind die Funktionen und die Ausbildung einer Ausführung der erfindungsgemässen Frankiermaschine beschrieben.
Zum besseren Verständnis wird dabei auf die Bezugszeichen und Bilder, in denen Ausführungsformen der Erfindung dargestellt sind, Bezug genommen.

1A vordere Steuerkurve für rechte Gegendruckrolle
1B hintere Steuerkurve für rechte Gegendruckrolle
2A vordere Steuerkurve für linke Gegendruckrolle

2B	hintere Steuerkurve für linke Gegedruckrolle
3	Hauptwelle
4	hintere Seitenwand
5	vordere Seitenwand
6A	Gegendruckhebel, links, vorne
6B	Gegendruckhebel, links, hinten
7A	Steuerhebel, links, vorne
7B	Steuerhebel, links, hinten
8A	Gegendruckhebel, rechts. vorne
8B	Gegendruckhebel, rechts, hinten
9A	Steuerhebel, rechts, vorne
9B	Steuerhebel, rechts, hinten
10	Achse für Gegedruckhebel und Steuerhebel
11	Anschlagbolzen für Gegendruckhebel rechts
12	Anschlabbolzen für Gegendruckhebel links
13	Gegendruckrolle rechts
14	Stützrolle
15	Gegendruckrolle links
16A	Schwinge, vorne für Stützrolle
16B	Schwinge, hinten für Stützrolle
17	Achse für Schwinge
18	Federeinhängestange
19	Federeinhängung
20	Zugfeder für Steuerhebel
21	Stützrollenträger mit Tastausleger
22	Schlepphebel
23	Schneckenwelle
24	Schneckenrad
25	Gabellichtschranke

26 Schlitzscheibe
27 Schaltnocke für Hauptwellengrundstellung
28 Mikroschalter
29 Steuerrolle
30 Zugfeder für Gegedruckhebel
31 Gleichstrommotor
32 Antriebswalze rechts
33 Antriebswalze links
34 Achse für Gegendruckrolle rechts
35 Anschlag für Schlepphebel
36 Zugfeder für Schlepphebel
37 Anschlag für Tastausleger
38 Tastrad für Inkrementalgeber
39 Niederhalteplatte resp. Führungsteil
40 Antriebsmotor für Vorschub
41 Getriebe für Antriebsrollen
42 Inkrementalgeber, Encoder
43 Ausleger am Stützrollenträger

Beschreibung der Zeichnungsinhalte bei folgenden Figuren:

Fig. 1 Frontansicht der kompletten Gegendruckmechanik, einschliesslich Antrieb, Tastrad und Hauptwellenantrieb und

Fig. 2 Draufsicht auf Gegendruckmechanik.

Bei der Einzelbrieffrankierung wird der Brief manuell in die Frankiermaschine eingelegt. Fotozellen starten bei exakter Kuvertposition den Frankiervorgang. Die beim Einlegen des Kuverts sich in einer unteren Position befindenden Gegendruckrollen werden über Steuerkurven der Hauptwelle nach oben bewegt und drücken das Briefgut gegen die oberen Antriebswalzen. Der Brieftansport resp. der Fran-

kiervorgang werden nun ausgelöst.
Der Gegendruck entsteht aus Gegendruckrollen. Zwei Rollen liegen unter den rechten und linken Antriebswalzen. Eine dritte, mittlere Rolle hat die Aufgabe den Brief unter den Druckköpfen auf das erforderliche Höhenniveau zu bringen, ohne den Brief gegen die Stirnflächen der Drucköpfe zu drücken, damit das Druckbild unverschmiert bleibt. Nach dem Frankieren bewegen sich die Gegendruckrollen wieder nach unten und geben den Spalt für das Einlegen eines neuen Kuverts frei.

Beschreibung zu den Figuren 1 und 2:
Die Gegendruckhebel sind in der Grundstellung zum Einlegen eines Einzelbriefes bereit. Sobald der Brief in seiner exakten hinteren und rechts am Tischanschlag angelegten Position ist, wird über eine Reflexlichtschranke die Frankiermaschine aktiviert. Zuerst dreht sich die Hauptwelle 3 um ca. 1/3 Umdrehung im Uhrzeigersinn. Die Steuerhebel 7, 9 werden über die Steuerrollen 29 durch die Steuerkurven 1, 2 nach oben geschwenkt. Die Gegendruckhebel werden über die Zugfedern 30 ebenfalls nach oben mitgewegt, bis die Gegendruckrollen 13, 15 an den Antriebswalzen 32, 33 anliegen. Die Steuerhebel bewegen sich noch etwas weiter, bis die Steuerkurve ihren Höchstpunkt erreicht hat. Der mögliche Überhub der Steuerhebel wird durch die gefederte Ankopplung der Gegendruckhebel ausgeglichen. Die Stützrolle 14 hat sich über den Schlepphebel 22 auf dasselbe Niveau eingestellt. Der Brief ist nun zwischen den Antriebswalzen und den Gegendruckrollen eingeklemmt. Der Antriebsmotor 40 treibt über das Getriebe 41 die Antriebswalzen 32, 33 an und bewegt den Brief von rechts nach links. Die Geschwindigkeits- und Positionsdetektierung erfolgt über den Inkrementalgeber 42 und dasTastrad 38. DasTastrad wird über Reibung vom sich bewegenden Briefumschlag angetrieben und erfasst so die exakte Geschwindigkeit der Briefoberfläche. In Abhängigkeit von der Briefposition spritzen die Tintenstrahldruckköpfe zeilenweise entsprechende Muster ab, die in Folge zu dem gewünschten Druckbild führen. Die Niederhalteplatte resp. Führungsteil 39 hält den Brief auf einen exakten Abstand zu der Druckkopf-

stirnseite um bezüglich Auflösung ein sauberes Druckbild erhalten zu können und ausserdem zu verhindern, dass die gedruckten Zeilen bei der Bewegung des Kuverts verschmiert werden. Nach Beendigung des Frankiervorganges schaltet der Antriebsmotor ab und die Hauptwelle dreht sich wieder in ihre Grundstellung zurück, die Gegendruckhebel nehmen wieder ihre Ausgangsstellung ein.
Die Tintenstrahldruckköpfe sind auf einem Justagemodul fixiert. Über diese Mechanik lassen sich die Druckköpfe genau zueinander justieren, damit das Anfangspixel des einen Kopfes mit dem Endpixel des zweiten Kopfes genau übereinstimmen und so keine Druckbildlücken entstehen. Die Druckköpfe werden über Schläuche an einem einfach austauschbaren Tintenbeutelbehälter angeschlossen. Bei der Erstinbetriebnahme müssen die Tinte aus dem Tintenbeutel abgesaugt und die Druckköpfe geflutet werden.

Numerierungs- und Teilebenennungsliste für Druckkopf-Justagemodul:

301A vorderer Tintenstrahldruckkopf
301B hinterer Tintenstrahldruckkopf
302 Unterlagsscheibe
303 Spannblech für Druckkopf
304 verstellbare Druckkopfträgerplatte
305 starre Druckkopfträgerplatte
306 Stellschraube
307 Federscheibe für Justageweg
308 Federscheibe für Anpressung
309 Bundschraube
310 Spannschraube
311 Einpressgewindebuchse
312 Butzen für die Druckopfpositionierung
313 Kopfplatte
314 Trägerplatte

315 Säulenführungsbuchse
316 Hubsäule
317 Niederhalteplatte resp. Führungsteil
318 Druckfeder
319 Hubplatte
320 Hubexzenter
321 Feststellschraube
322 Einpressgewindebuchse
323 Distanzhülse

Beschreibung der Zeichnungsinhalte bei folgenden Figuren:
Fig. 3 Draufsicht auf das Druckkopf-Justagemodul,
Fig. 4 Frontansicht auf die Druckköpfe und die Druckkopfträgerplatten, in dieser Ansicht sind nicht alle Teile in ihrer wahren Position dargestellt und
Fig. 5 Frontansicht auf die Druckköpfe und die Druckkopfträgerplatten.

Bei der hier beschriebenen Frankiermaschine werden zur Realisierung der geforderten Druckbildhöhe und der Auflösung zwei Tintenstrahldruckköpfe benötigt. Zur Erreichung der Druckbildhöhe sind die Druckköpfe in der Tiefe gegeneinander versetzt. D.h., dass die obere Hälfte des Druckbildes vom hinteren Druckkopf und die untere Hälfte vom vorderen Druckkopf erzeugt wird. Um im Druckbild keine Lücke oder ein Überdrucken zu erhalten, müssen die Pixelzeilen der beiden Druckköpfe gegeneinander justiert werden können. Die Druckköpfe sind ausserdem in der Draufsicht schräg angeordnet, da bei dieser Schrägstellung der effektive Abstand der einzelnen Druckdüsen geringer und so eine höhere Auflösung des Druckbildes möglich ist. Ein Druckkopf ist starr montiert, wogegen der zweite Drukkopf entlang der Düsenreihe relativ zum starren Druckkopf verschoben bzw. feinjustiert werden kann. An dem Druckkopf-Justagemodul ist auch die schon beschriebene Niederhalteplatte resp. Führungsteil gelagert.

Die Druckkopfeinheit ist als eigenständiges Modul ausgeführt, d.h.. dass die Montage als koplette Unterbaugruppe möglich ist und die Druckköpfe vor dem Gesamteinbau feinjustiert werden können. Auf der Trägerplatte 314 ist die starre Druckkopfträgerplatte 305 und die Kopfplatte 313 montiert. Der vordere Druckkopf 301A wird über die Butzen 312 genau positioniert und über kleine Prägungen am Spannblech 303 an die Druckkopfträgerplatte 305 angedrückt. Das Spannen erfolgt über die Spannschraube 310 und die Einpressmutter 311. Auf der Rückseite des starren Druckkopfträgers sitzt die verstellbare Druckkopfträgerplatte 304. Sie ist in der Tiefe verschiebbar und wird durch die Einpressgewindebuchsen 322 bzw. die Bundschrauben 309 geführt. Die Bundschrauben 309 drücken die verstellbare Druckkopfträgerplatte 304 über die Federscheiben 308 und die Unterlagsscheiben 302 an die Auflagefläche an. Die verstellbare Druckkopfträgerplatte lässt sich gegen die Reibung dieser Anpresskraft verschieben. Der hintere Druckkopf 301B ist wie der vordere positioniert und gehalten. Die verstellbare Druckkopfträgerplatte 304 weist an der vorderen Seite einen Umbug auf, in den eine Gewindebuchse eingepresst ist. Auf diese Gewindebuchse sind ein Federscheibenpaket 307 und die Distanzhülse 323 aufgebracht. Das Federpaket verspannt sich zwischen den abgebogenen Winkeln der starren und verstellbaren Druckkopfträgerplatten. Die Justage der verstellbaren Druckkopfträgerplatte erfolgt über die Stellschraube 306. Beim Anziehen der Stellschraube bewegt sich der hintere Druckkopf mit der Druckkopfträgerplatte nach vorne. Beim Lösen wandert die Einheit unter der Federkraft des Federpaketes 307 nach hinten. Durch die Vorspannung des Federpaketes wird jegliches Spiel aufgehoben. Der hintere Druckkopf 301B wird so eingestellt, dass die vorderste Tintenstrahldüse mit der hintersten des vorderen Druckkopfes übereinstimmt bzw. exakt einen Pixelabstand aufweist. Nachdem die Druckköpfe exakt justiert sind, wird der verstellbare Teil mittels der Feststellschraube 321 fixiert, damit sich dieser nicht mehr verstellen kann. In der Kopfplatte 313 sitzen noch zwei Säulenführungsbuchsen 315, die die Säulen 316 der Niederhalteplatte resp. Füh-

rungsteil 317 führen. Die Niederhalteplatte resp. Führungsteil 317 wird über die Hubexzenter 320 auf und abbewegt. Die Druckfedern 318 heben die Hubplatte 319 spielfrei nach oben an.

PATENTANSPRÜCHE

1. Frankiermaschine mit einem wenigstens einen Druckkopf aufweisenden Inkjet-Druckwerk zum Bedrucken von einlegbaren oder durchlaufenden flachen Versandobjekten, wie Briefe oder Postkarten, bestehend aus einem um den Druckkopf und gegenüber dessen Düsenmündungsebene vorstehend angeordneten Führungsteil (317), dem eine die Versandobjekte zwischen sich und gegenüberliegenden, um quer zur Förderrichtung angeordnete Achsen rotierende Förderrollen einer die Versandobjekte transportierenden Fördereinrichtung zugeordnet ist, wobei die Fördereinrichtung zwei mit dem Führungsteil eine Förderstrecke bildende Antriebsrollen aufweist, die in Förderrichtung (F) betrachtet vor und hinter dem Druckkopf gelagert sind, und gegenüberliegend, gegen die Antriebsrollen resp. ein dazwischen transportiertes Versandobjekt einen Druck ausübende Gegendruckrollen vorgesehen sind, dadurch gekennzeichnet, dass das Druckwerk wenigstens zwei Druckköpfe (301A, 301B) aufweist, die eine gemeinsame Düsen-

mündungsebene bilden, dass die Druckköpfe (301A, 301B) auf die Düsenmündungsebene betrachtet jeweils rechteckig ausgebildet, in einem spitzen Winkel zur Förderrichtung (F) der Versandobjekte und gegenseitig teilweise versetzt zueinander angeordnet sind.

2. Maschine nach Anspruch 1, dadurch gekennzeichnet, dass wenigstens einer der Druckköpfe (301A, 301B) in der von der Förderrichtung (F) der Versandobjekte abweichenden Richtung gegenüber dem anderen Druckkopf (301A, 301B) verschiebbar ist.

3. Maschine nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass der verstellbare Druckkopf (301B) an einer gegenüber einer den ortsfesten Druckkopf (301A) aufnehmenden, senkrecht zur Düsenmündungsebene angeordneten stationären Druckkopfträgerplatte (305) verstellbaren Druckkopfträgerplatte (304) befestigt ist.

4. Maschine nach einem der Ansprüche 2 oder 3, dadurch gekennzeichnet, dass die Druckkopfträgerplatten (304, 305)

durch eine in Verstellrichtung wirkende Spannvorrichtung (306, 307) ausgebildet ist.

5. Maschine nach 4, dadurch gekennzeichnet, dass die mit den Rückseiten aneinanderliegenden Druckkopfträgerplatten (304, 305) an einem in Verstellrichtung angeordneten Ende durch abgewinkelte Abschnitte ausgebildet sind, zwischen denen eine an einer die Abschnitte verbindenden Stellschraube (306) angeordnete Feder (307) vorgesehen ist.

6. Maschine nach einem der Ansprüche 3 bis 7, dadurch gekennzeichnet, dass die verstellbare Druckkopfträgerplatte (304) durch eine sie durchsetzende, in der ortsfesten Druckkopfträgerplatte (305) verdrehbar befestigte Schraube (309) arretierbar ist.

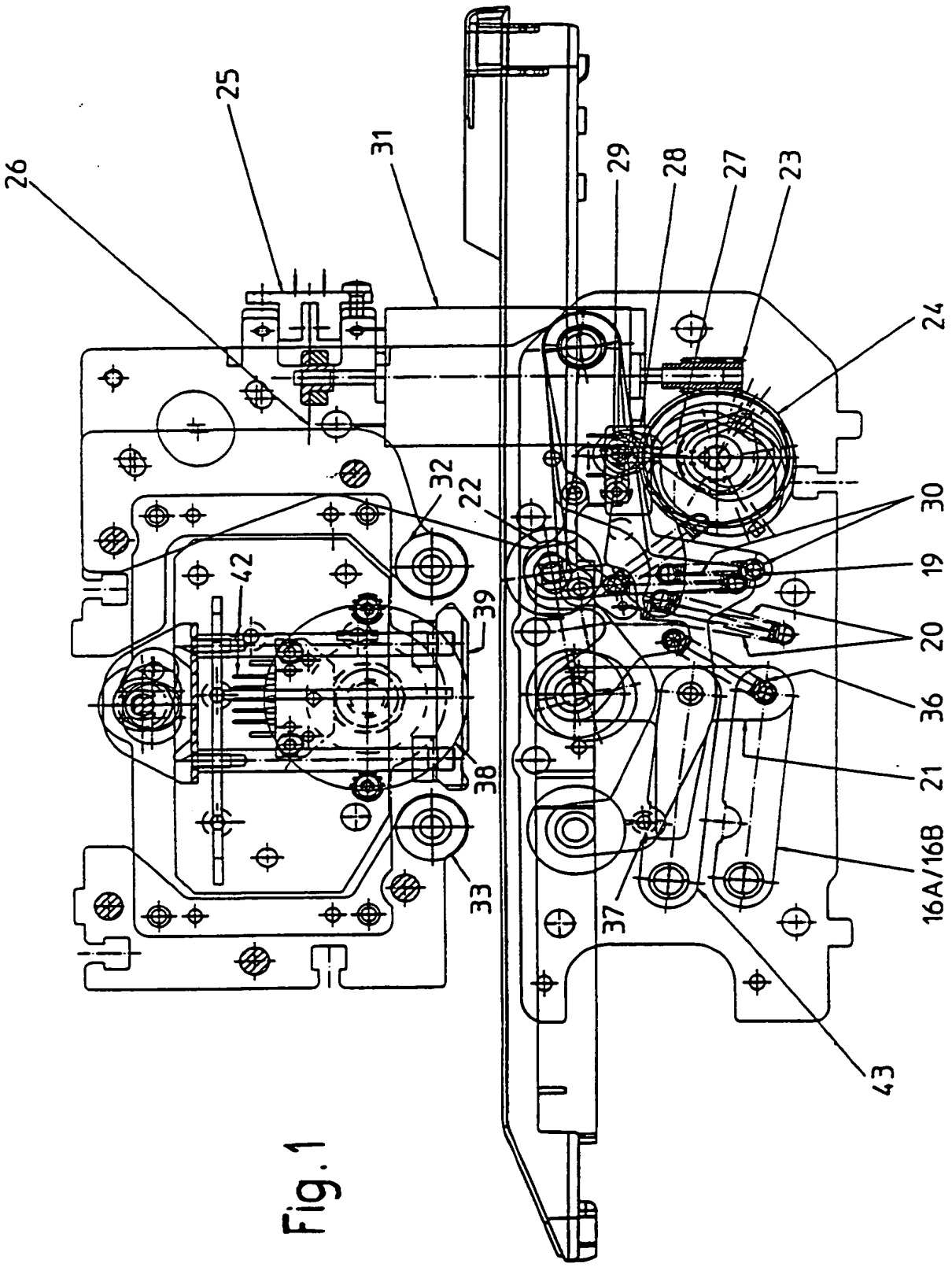


Fig. 1

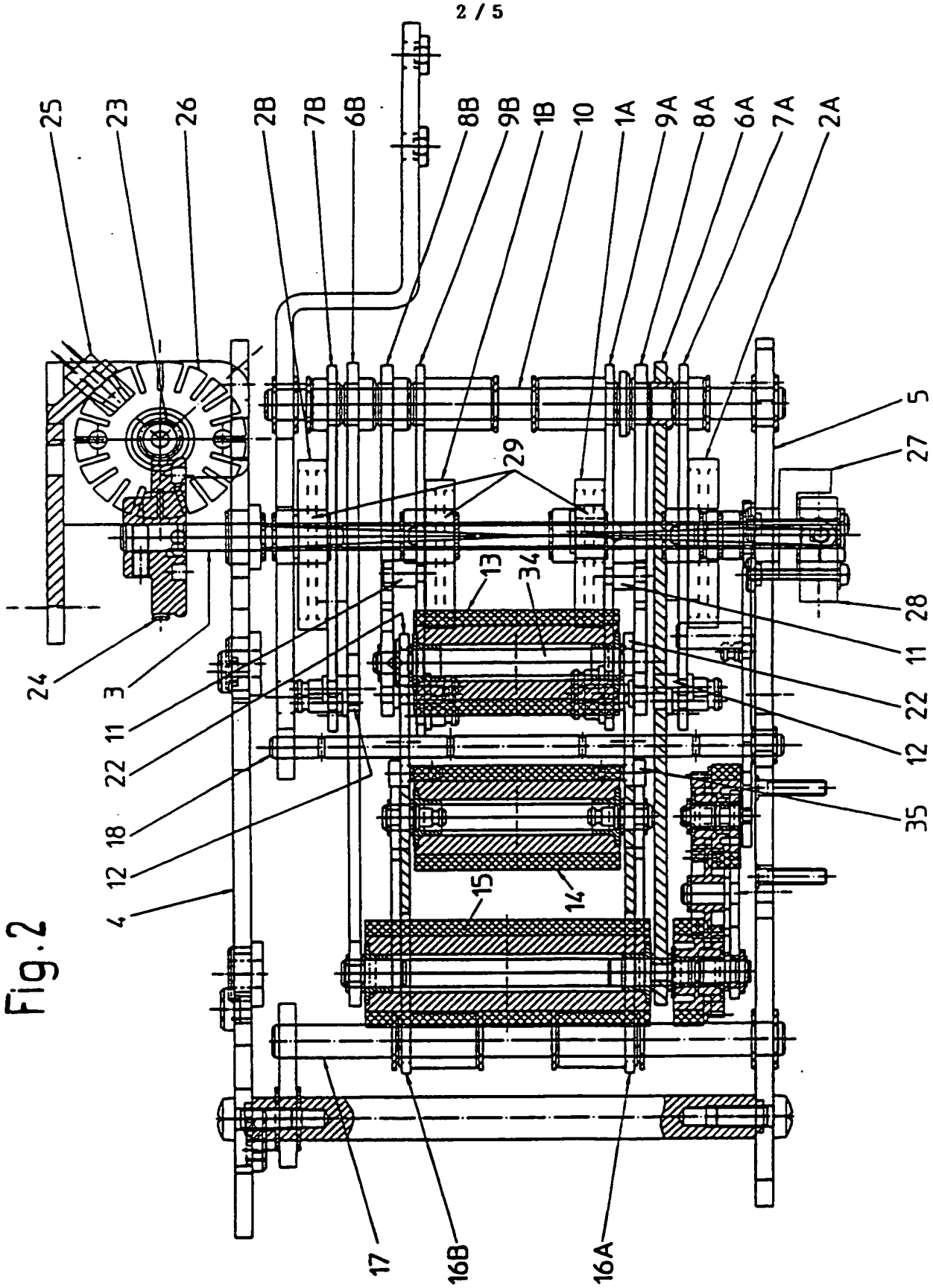

25
23
26
2B
7B
6B
8B
9B
1B
10
1A
9A
8A
6A
7A
2A
5
27
29
28
24
3
11
22
13
34
18
12
4
15
14
35
17
16B
16A

Fig.2

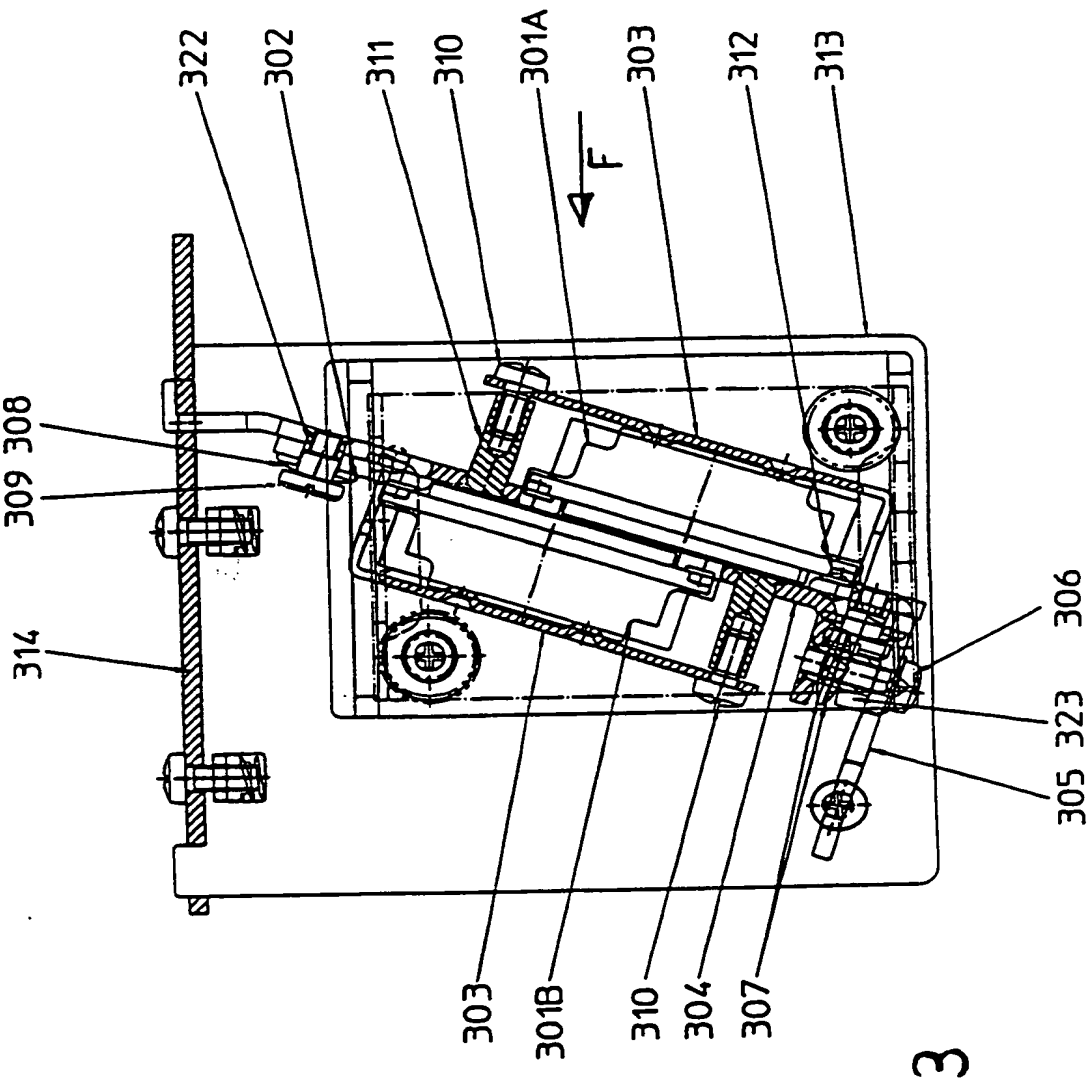

322
302
311
310
301A
F
303
312
313
309 308
314
306
323
305
303
301B
310
304
307

Fig.3

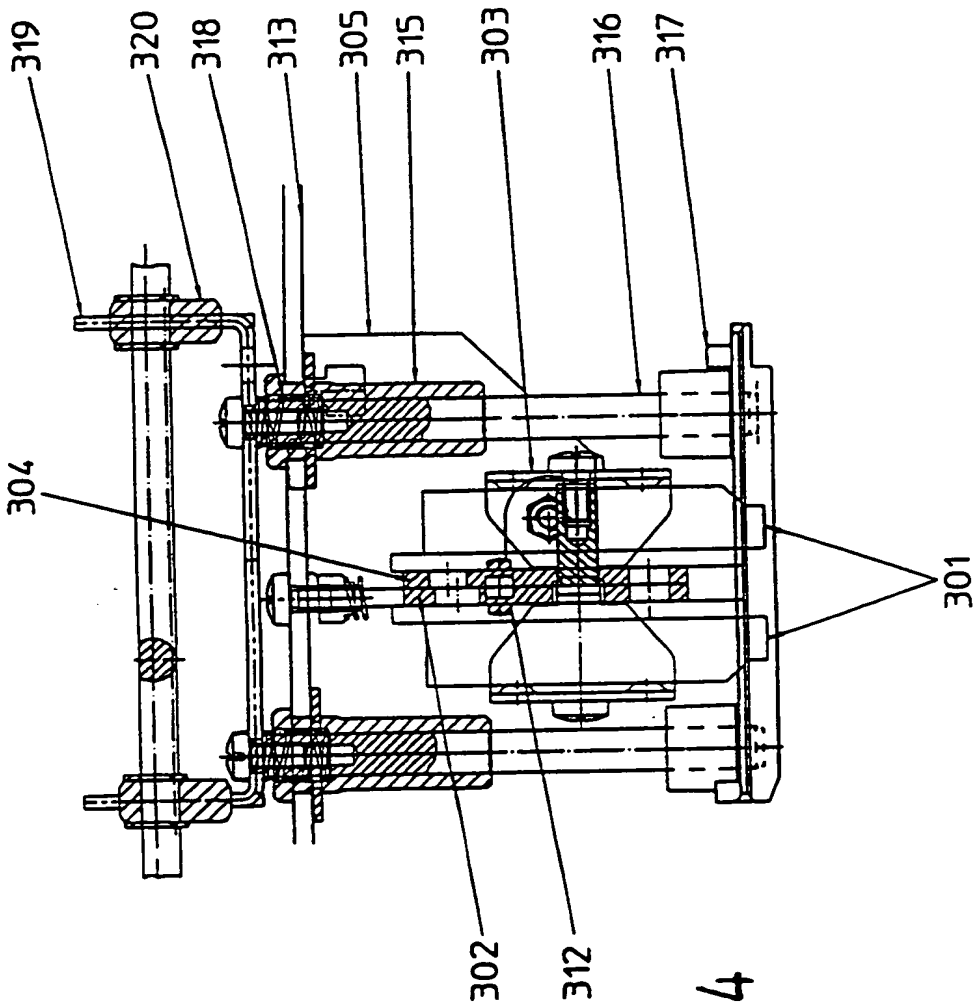


Fig. 4

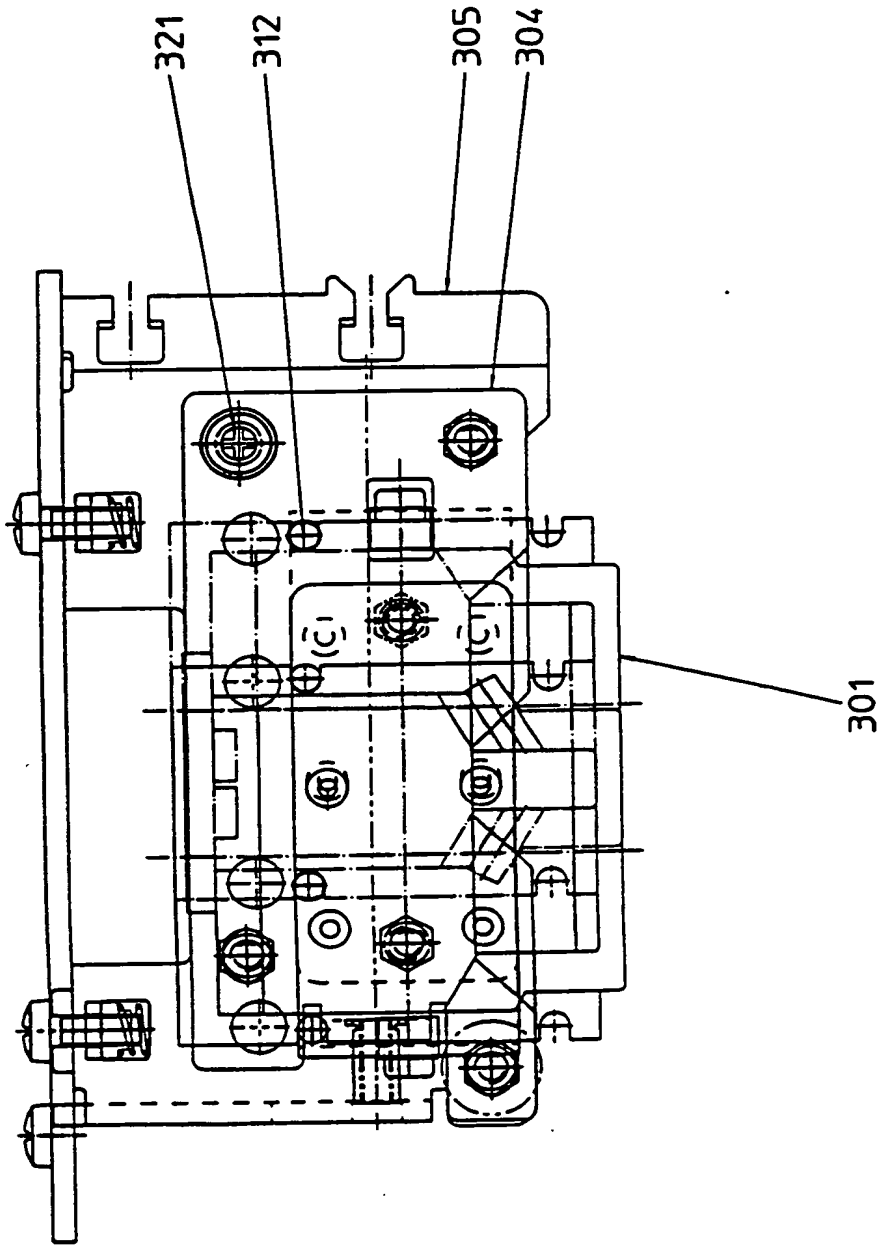


Fig.5

INTERNATIONAL SEARCH REPORT

I. .ational Application No
PCT/CH 01/00121

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B41J13/12 G07B17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B41J G07B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 166 883 A (GILHAM DENNIS T) 24 November 1992 (1992-11-24) column 3, line 17 -column 5, line 32; figure 4	1-3
Y	US 5 913 627 A (LILLY NORMAN R ET AL) 22 June 1999 (1999-06-22) column 3, line 8 -column 4, line 42; figures 1,2	1-3
Y	US 4 821 049 A (ECKL JOHN K) 11 April 1989 (1989-04-11) column 3, line 19 -column 5, line 45; figures 1-3	1-3

-/--

[X] Further documents are listed in the continuation of box C.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 June 2001	22/06/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Widmeier, W

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/CH 01/00121

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 806 994 A (SALAZAR EDILBERTO I ET AL) 15 September 1998 (1998-09-15)	1-3
A	column 6, line 20 -column 7, line 37; figure 4	4-6
Y	US 5 440 979 A (BONHAM RICHARD E ET AL) 15 August 1995 (1995-08-15) figure 1	1
A	EP 0 961 235 A (PITNEY BOWES) 1 December 1999 (1999-12-01) column 7, line 49 -column 8, line 22; figures 2,3	1-3

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/CH 01/00121

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5166883 A	24-11-1992	GB 2206082 A,B	29-12-1988
US 5913627 A	22-06-1999	NONE	
US 4821049 A	11-04-1989	US 4903954 A	27-02-1990
US 5806994 A	15-09-1998	CA 2250343 A EP 0911765 A	15-04-1999 28-04-1999
US 5440979 A	15-08-1995	CA 2102716 A,C GB 2272401 A,B	17-05-1994 18-05-1994
EP 0961235 A	01-12-1999	US 6224280 B	01-05-2001

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen	PCT/CH 01/00121

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 7 B41J13/12 G07B17/00

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 7 B41J G07B

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)
EPO-Internal

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie°	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
Y	US 5 166 883 A (GILHAM DENNIS T) 24. November 1992 (1992-11-24) Spalte 3, Zeile 17 -Spalte 5, Zeile 32; Abbildung 4	1-3
Y	US 5 913 627 A (LILLY NORMAN R ET AL) 22. Juni 1999 (1999-06-22) Spalte 3, Zeile 8 -Spalte 4, Zeile 42; Abbildungen 1,2	1-3
Y	US 4 821 049 A (ECKL JOHN K) 11. April 1989 (1989-04-11) Spalte 3, Zeile 19 -Spalte 5, Zeile 45; Abbildungen 1-3	1-3

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[X] Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

[X] Siehe Anhang Patentfamilie

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11. Juni 2001	22/06/2001

Name und Postanschrift der Internationalen Recherchenbehörde	Bevollmächtigter Bediensteter
Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Widmeier, W

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INTERNATIONALER RECHERCHENBERICHT

	ationales Aktenzeichen
	PCT/CH 01/00121

C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie°	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
Y	US 5 806 994 A (SALAZAR EDILBERTO I ET AL) 15. September 1998 (1998-09-15)	1-3
A	Spalte 6, Zeile 20 -Spalte 7, Zeile 37; Abbildung 4	4-6
Y	US 5 440 979 A (BONHAM RICHARD E ET AL) 15. August 1995 (1995-08-15) Abbildung 1	1
A	EP 0 961 235 A (PITNEY BOWES) 1. Dezember 1999 (1999-12-01) Spalte 7, Zeile 49 -Spalte 8, Zeile 22; Abbildungen 2,3	1-3

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen
PCT/CH 01/00121

Im Recherchenbericht angeführtes Patentdokument		Datum der Veröffentlichung	Mitglied(er) der Patentfamilie		Datum der Veröffentlichung
US 5166883	A	24-11-1992	GB	2206082 A,B	29-12-1988
US 5913627	A	22-06-1999	KEINE		
US 4821049	A	11-04-1989	US	4903954 A	27-02-1990
US 5806994	A	15-09-1998	CA	2250343 A	15-04-1999
			EP	0911765 A	28-04-1999
US 5440979	A	15-08-1995	CA	2102716 A,C	17-05-1994
			GB	2272401 A,B	18-05-1994
EP 0961235	A	01-12-1999	US	6224280 B	01-05-2001